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ABSTRACT

The purpose of this symposium on research in distance education was to continue the process of building the network of scholars and climate of cooperation and communication necessary for further development of distance education and to provide an opportunity for discussion. Four main areas of focus for the symposium were learning and characteristics of learners; course design and communication; instruction and learner support; and theory, policy, and management. There are seven papers in this collection: "Learning Style Preferences and Distance Education: A Review of Literature and Implications for Research" (Diane Billings); "Thinking Holistically: A New Perspective on Distance Learning" (Elizabeth Burge); "A Paradigm for Generating Curriculum Design Oriented Research Questions in Distance Education" (Francis Dwyer); "Systems Analysis of Integrated Distance Education by Discourse" (Farhad Saba); "Computer Empowerment and the Ten Thousand Things" (Gerald M. Santoro); "Interactive, Televised Instruction: What Is Its Potential for Interaction?" (Helen Ritchie); and "National and State Policy in Distance Education: The Issues and Research" (Richard T. Hezel). Most of the papers contain references. (JLB)

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DISTANCE EDUCATION SYMPOSIUM: SELECTED PAPERS

PART 2

Papers Presented at
The Second American Symposium
on Research in Distance Education

The Pennsylvania State University
May, 1991

Diane Billings
Elizabeth Burge
Francis Dwyer
Farhad Saba
Gerald M. Santoro
Helen Ritchie
Richard T. Hezel

Number 8 in the series Research Monographs

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Preface

In Spring 1991, The American Center for the Study of Distance Education, a graduate teaching and research group at Penn State University with a network of associates around the country, extended invitations to approximately fifty researchers and scholars in distance education to participate in The Second American Symposium on Research in Distance Education. Hosted by Dr. Michael Moore, Director of The Center, and funded by the Annenberg/CPB Project, the Symposium brought together a select group of educational researchers to share their knowledge of the present and projected condition of the distance education field, with particular reference to developments since the First Symposium of July 1988.

The purpose of the Second Symposium was to continue the process of building the network of scholars and the climate of cooperation and communication necessary for the further development of distance education by providing an opportunity for discussion among some of those who had been present in 1988, augmented by an equal number of persons who had identified an interest in distance education research since then. Because the First Symposium had resulted in an important set of papers subsequently published in the Pergamon book *Contemporary Issues in American Distance Education*, each person invited to the Second Symposium was asked to prepare a paper, the hope being that these papers would form a series of publications as well as provide a vital resource for discussion in the Symposium.

The authors were asked to "review recent developments in research and study of distance education, to conduct further analysis of research needs, and to plan future research and scholarly work." In order to refine and carry out this broad agenda, four areas of focus were identified: 1) Learning and Characteristics of Learners; 2) Course Design and Communication; 3) Instruction and Learner Support; and 4) Theory, Policy, and Management. The following papers comprise the second in a series of monographs devoted to the research issues considered at the Second Symposium.

Michael G. Moore

Learning Style Preferences and Distance Education: A Review of Literature and Implications for Research

Diane Billings

Introduction

Teaching and learning are dynamic and complex interactions between the learner, setting, and instruction with intended outcomes of course completion and learner achievement. The relationship between these elements is critical when traditional instructional delivery methods are modified to accommodate learners at a distance. Recent reviews of literature (Cookson 1989; Moore and Thompson 1990) reveal that distance education courses are effective, regardless of the instructional method or delivery system, but little is known about the effects of learning style preference on learning outcomes. What occurs as the student uses learning styles effective for traditional learning when enrolled in distance education courses? The purposes of this paper are to review the literature regarding the effects of learning style preferences in distance education, propose a conceptual framework for understanding the unique relationships between learners and instruction at a distance, and suggest directions for future research in this area.

Distance Education

Distance education typically is described as the separation of teacher and student in time and space (Holmberg 1986). Although this classic definition is helpful in establishing the parameters of distance education, recent advances in instructional technology and in understanding student needs in distance education settings necessitate an elaboration of the definition.

Lauzon and Moore (1989) describe distance education by the relationships of technology and media, that is, the communication channels (print, audio, visual), delivery systems (mail, communications networks, computers), method (group, individual), and delivery mode (synchronous, asynchronous). Barker, Frisbie, and Patrick (1989) further distinguish distance education as being correspondence-based or telecommunications-based, according to the levels of teacher/student and student/student interaction. This taxonomy recognizes that newer technologies minimize the separation of teachers and students in time, if not in space. These descriptions of distance education add clarity and provide precision for conceptualizing the variables for empirical studies.

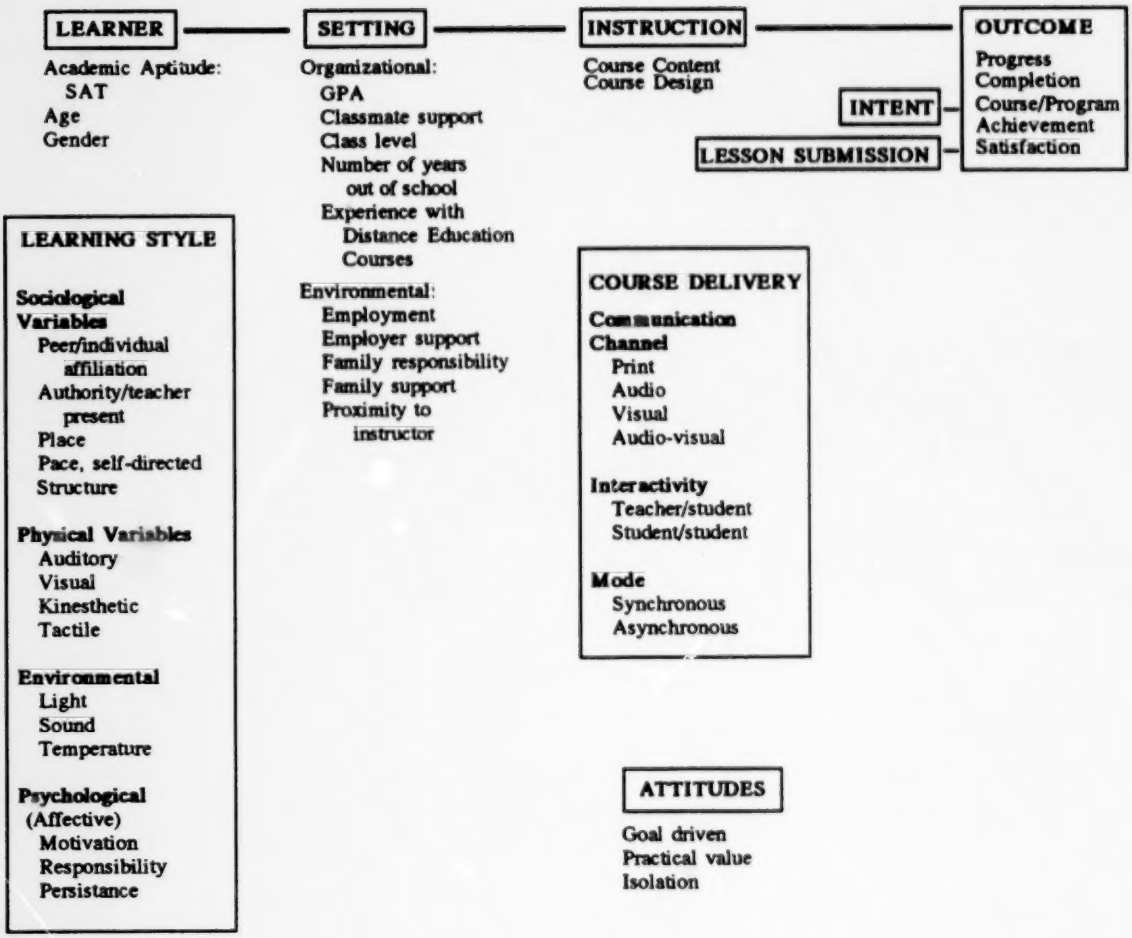
Learning Styles

The way in which a learner receives and interacts with instruction and responds to the learning environment is known as the student's learning style, or learning style preference (LSP). Learning style is further described as the "cognitive, affective, and physiological behaviors that serve as relatively stable indicators of how learners perceive, interact and respond to the learning environment" (Keefe 1979). Although there is debate about the advantages and disadvantages of matching teaching style with learning style, (Partridge 1983), most researchers agree that achievement and satisfaction are improved when students study using their preferred learning style (Dunn, Beaudry, and Klaves 1989). Additionally,when learning style and teaching strategy match, learning may be more effective and efficient (Partridge 1983) and there is less anxiety (Loesch and Foley 1988).

A variety of frameworks (Keefe and Ferrell 1990) and instruments (Ehrman 1990) have been used to identify and measure the attributes of learning style. For the purposes of this review, learning style elements have been categorized in four areas: sociological, physical, environmental, and psychological. The *sociological* variables refer to learners' preference for having others such as peers, professors, or other authorities present in the learning environment. Sociological elements also include preferences for pacing, (by self or other) and structure (high or low) in the lesson or course design. Another group of variables include *physical* or perceptual preferences. These pertain to channels through which information is received: visual, auditory, or kinesthetic channels. *Environmental* variables are believed to influence the study environment, with learner's identifying among other things preferences for the amount of light, sound, or heat present while studying. Finally, there is a group of *psychological* or affective variables including motivation, responsibility, and persistence.

Learning Style and Distance Education

Like traditional education, distance education is a complex interaction of learner, setting, instruction, and outcome. A conceptual model of progress toward course completion in a distance education setting adds intent to complete the course or program and lesson submission activity (Billings 1987). That model is adapted here (Figure 1) to highlight the potential interaction of learning styles and course delivery and to provide a framework for the review of literature regarding the interaction of learning style, delivery system, and outcomes which follows.



Adapted from Billings, 1987

Figure 1. Learning Styles and Distance Education: A Conceptual Framework

Sociological Variables

Students differ in their need to work with others, have close contact with teachers, or have structured, planned, or paced learning experiences. These needs may be more evident when students interact with instructional delivery systems that have varied communication channels, levels of interactivity, and delivery modes.

Peer Affiliation. Several studies have investigated learners' preference for studying alone or with peers. Coggins (1989) studied the impact of learning style on program completion in a group of adult students at an extended degree program of a large University. Using Canfield's (1980) Learning Style Inventory (LSI), Coggins studied the four Learning Style Preference (LSP) variables measured by the instrument (condition, modality, content variables, and expected performance). In a sample of 153 students, Coggins identified differences between students who completed and those who did not. Of the learning style preferences measured by the Canfield instrument, there was a difference on the peer affiliation scale; that is, learners with high peer affiliation tended not to complete the course.

Billings (in press) studied the effects of studying alone or in groups for students using interactive videodisc instruction (IVDI). After students' LSPs for studying in groups or alone were identified using the Dunn, Dunn, and Price (1986) Productivity Environmental Preference Survey (PEPS), they were instructed to view an IVDI lesson in groups or alone as they preferred. Learner achievement was measured by posttest and attitude toward IVDI by a semantic differential tool. Although the sample size was small (N=45), students who both had strong preferences for studying in groups and who did so indicated more positive attitudes toward IVDI than those who studied alone. The sample size was too small to determine achievement effects.

Dille and Mezack (1991) developed a profile of risk in a sample of 188 students enrolled in prepackaged telecourses. They used Kolb's Learning Style Inventory (LSI) (1986) to determine learning style differences between successful students (completed the course with "C") and unsuccessful students (withdrew or did not obtain a "C"). The authors found significant differences on two of the LSI scales. Unsuccessful students had higher means on the CE (Concrete Experience) Scale. These higher scores are interpreted as reflecting students' need to relate to people and may reflect the social isolation of telecourses. Additionally, unsuccessful students had lower scores on the AC-CE (Abstract Conceptualization minus Concrete Experience) Scale, indicating that students with a less concrete style are better suited to telecourse learning.

Instructor Affiliation. Having need for an instructor or authority present has been identified as influencing learning outcomes. For example, Coggins (1989), using Canfield's LSI to identify conditions of learning, found that noncompleters in the extension program had greater needs for an instructor present than those who actually completed the course.

In an exploratory study of computer conferencing as a course delivery system, Phillips and Pease (1989) surveyed participants in a top level management course about their reasons for enrolling in the course. Seventeen of the twenty-six participants responded to the survey. Although the primary reason given for enrolling was intrigue with the medium, participants also cited access to experts (instructors) and an opportunity to form social relationships (meet new people) and establish networks as other reasons for taking the course. During the course, several of the participants actually met face-to-face or on the telephone to continue dialogue established during the course.

Pace, Self-direction, Self-management. Several researchers have investigated students' preference for self-pacing and capability for self-management. Wiley (1983) investigated the effects of a self-directed learning (SDL) project and preference for structure on self-directed learning readiness. In this study, two experimental groups conducted a self-directed learning project, and two control groups followed traditional teacher-directed learning. Preference for structure was measured using Ginther's Reaction to Statements (RTS) instrument, and self-directed readiness was determined using Guglielmino's Self-Directed Learning Readiness Scale (SDLRS) (Long and Agyekum 1983). Although neither preference for structure nor self-directed learning readiness contributed to variance in self-directed learning readiness on a posttest, the interaction of these two variables did account for some variance. Wiley (1983) concludes that persons who prefer low structure benefit from SDL teaching more than those who prefer high structure.

Along similar lines, Russell (1990) used the RTS and SDLRS to identify differences and relationships with students using a module vs. lecture approach to learning a unit of nursing content. Russell found that as the need for structure increased, self-directed learning readiness decreased, but neither RTS or SDLRS was able to predict achievement.

Kern and Matta (1988) studied the self-pacing needs of students using computer-assisted instruction (CAI). They used the Myers-Briggs Type Indicator to differentiate students preferring to work at a steady, self-managed pace (sensing type) from those needing human guidance (intuitive type) to complete the course. Those learners scoring higher on the sensing scale scored higher on a posttest of achievement than those identified as intuitors. The authors conclude that there are measurable differences in student performance based on psychological type, and that students who are unable to self-pace, and prefer human interaction to provide guidance, pacing, and sequencing instruction, appear to benefit from the human interaction.

Also using the Myers-Briggs to identify the Learning Style Preference of students in a CAI military training program, Hoffman and Waters (1982) examined learning style differences in relation to the pace at which the course was completed and to course dropout. Students scoring high on the sensing scale (those who maintained a steady, self-managed pace) completed the

course earlier. Those students scoring high as extroverted intuitors (prefer working with others, need human support) had a higher dropout rate. Interestingly, when institutional interventions such as discussion group and small group work at the computer terminal were added, dropout rates for these students decreased.

Pacing, in the sense of initiating course activity in courses in which communication is asynchronous, such as self-paced or correspondence courses, has been noted to be a factor related to course completion. In a study of participants in a self-paced, print-based continuing education course, Armstrong, Toebe, and Watson (1985) found that the earlier students started the course, the more likely they were to complete. Similar findings are reported by Billings (1987), who found that early submission of the first lesson was significantly related to course progress. In these studies student LSPs were not measured; however, the phenomenon merits further investigation as a function of LSP.

Physical Variables

Students identify preferences for receiving information through various sensory channels. The literature was reviewed to find studies of learning style preferences related to physical variables.

Visual. In a study of the effects of brain dominance, Benedict and Coffield (1989) compared nursing students using computer-assisted instruction (CAI) with those attending lecture to determine preferences for hemisphericity using the Wagner Preference Inventory. The results revealed that learners with right hemisphere dominance (visual) using CAI scored higher on a posttest than learners with left hemisphere dominance (auditory) in a lecture group.

Other. McFarland (1990) used selected scales from PEPS to examine the relationships of auditory, tactile, and visual preferences on attitudes toward the use of CAI. No significant relationships for these subscales were identified. Using Kolb's LSI to determine the influence of learning style preference on learning outcomes, as measured by achievement on posttest when using CAI, Kirchoff and Holzemer (1979) found that students having high scores on the learning mode of Active Experimentation scored higher on the posttest; the results are not interpreted as being educationally significant, however. Billings and Cobb (1992) studied the effects of learning style preferences, attitude, and GPA on learner achievement using interactive videodisc instruction. Using PEPS to identify learning style preferences, they found no significant differences between LSP and learner achievement on a posttest. Similar findings are reported in Coggins' (1989) study using Canfield's LSI to determine modalities of listening (auditory), reading (visual), iconics (audio-visual), and hands-on experience (kinesthetics); there were no significant differences in

learning outcome as measured by completion between those who completed the program and those who did not.

Environmental Variables

None of the studies reviewed reported research on the effects of environmental variables. It is unclear at this point whether this situation reflects a gap in the literature or the lack of significance these variables have for learning outcomes.

Psychological Variables

Psychological variables, although difficult to define and measure, are believed to influence outcomes of distance education courses. Motivation and persistence have been investigated.

Motivation. Armstrong, Toebe, and Watson (1985) noted that motivation had the strongest impact on students who completed a continuing education course, that is, more highly motivated students were more likely to complete the course. The students identified motivation levels on a self-report instrument.

Billings (1987) studied 131 students enrolled in correspondence courses. Students answered questions to determine motivation, operationalized as goal-directedness, for completing the course. In the path model, goal-directedness accounted for 23% of the variance (beta=23) of the intent to complete variable. Goal directedness, therefore contributes to course progress as indicated by stated intentions to complete the course, the variable accounting for most of the effect on progress toward completion.

Persistence. Atman (1989), in an instrument validation study, examined the "fit" of the Myers-Briggs Type Indicator with the Goal Orientation Index, which measures goal setting and persistence behavior. A conceptual fit was determined. Although not empirically tested, the data could be used to identify goal-directed, self-managed behavior associated with motivation and persistence in distance education settings.

Conclusions

Eleven empirical studies were reviewed for the effects of student learning styles on course outcomes in distance education. Course delivery systems included CAI (7), self-directed

instruction (2), computer conferencing (1), and extension program (1). There were no reports of studies of learning styles in courses taught by videoteleconference or audioconference.

Seven of the eleven studies reviewed reported that sociological variables had significant effects on course outcomes. This may reflect the importance of the need for contact with peers and professors or the need for pacing and structure. While there is a considerable body of research that indicates that the institutional interventions of pacing, feedback, and turn around time influence persistence and course completion (Cookson 1989; Taylor et al. 1986), persistence in these reports was not identified as a student learning style characteristic, but rather as a factor in course progress.

Physical variables (auditory, visual, kinesthetic) seemingly have little effect on learning outcomes. Five studies reviewed reported findings for the physical elements, but four of the five reported no significant differences. Environmental and psychological variables apparently have little influence on learning outcomes. One study reported that the psychological element (motivation) influenced course completion. The lack of studies using text as the primary course delivery method may account for the absence of findings related to environmental variables.

Implications for Future Research

The nature of adult learning in distance education settings remains elusive. Suggestions for continued research about the effects of learning style preferences and distance education include the following:

- Investigate further the significance of sociological variables. It is clear from the literature review that preferences for working with teachers, peers, and authorities or the need for pacing and structure influence learning outcomes. Subsequent research should more clearly distinguish communication channels, level of interactivity, and communication mode in the course delivery system.
- Investigate the relationships between learning styles and instructional delivery systems. Not all distance education is similar; how do these differences relate to student learning-style preferences? Norton (1985) suggests that print-oriented problem solving requires a different set of skills than do computer-oriented problem solving activities. Can students accommodate to these differences in computer-based learning technologies?
- Determine the extent to which students' knowledge of their style preferences influences outcomes. Can students adapt their style preferences to course delivery? Can knowledge about learning style preferences be used to counsel students (institutional interventions) to adapt learning style to course delivery?
- Investigate the relationships between design of instruction and use of learning-style preferences (Hayes 1990; Kern and Matta 1988). That physical and environmental variables contribute little to outcomes should be verified.

- Continue to pursue the meaning of persistence as a learning-style variable. Lack of persistence in course completion is costly to students and academic institutions. Previous research has focused on institutional intervention; further research could focus on identifying, from a learning-styles perspective, the meaning of persistence.

Summary

A review of the literature on learning styles and distance education indicates students' learning style preferences influence learning outcomes. Sociological variables have the greatest effect on course completion, achievement, and satisfaction; physical, environmental, and psychological variables apparently have little impact. An understanding of the relationships of learning styles and course delivery merits continued research and is facilitated by a conceptual model that clearly specifies the variables under investigation.

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Thinking Holistically: A New Perspective on Distance Learning

Elizabeth J. Burge

The discussion that follows is the second part of my two-part exploration of a holistic perspective on distance learning. In Part One I identified the key features of the naturalistic paradigm and its qualitative methodologies, and listed issues for further reflection (Burge 1992). In Part Two I will expand the qualitative methodological focus on the interconnectedness of reality by discussing my emerging ideas on the concept of holism. I will introduce the holistic perspective, offer some holistic learning strategies for both adult learners and educators, and suggest ways in which we as reflective practitioners can promote the holistic perspective.

Definitions

Holism in education is not a new concept: its history extends back to Socrates and Plato (Miller 1988), with more recent advocates being Maria Montessori, Rudolf Steiner, and A. S. Neill. As Miller points out, the renewed interest in holistic education is evidence of a wider, global transformation of perspective towards a holistic paradigm. What do we mean by a holistic approach? Definitions abound from many different fields, but they all focus on two things: the interconnectedness of reality and the concept of wholeness, as distinct from reductionism and fragmentation. A recent review of changes in the conceptualization of structures in science, society, and religion indicates a trend away from reductionist and materialist approaches toward holistic approaches that emphasize unity within diversity (Lemkow 1990). Lemkow describes eleven points that lead to a "consistent and lawful universe" in which all life forms are "interdependent and interpenetrating" with "mutually defining polarities" and other individual differences. In another review, Harman argues that the empirical research approach in science limits our understanding of complex phenomena. We need an alternative research model, a holistic one that works "on the basis of an ontological assumption of oneness and wholeness, and on epistemological choice to include as input both physical sense data and inner, subjective experience" (Harman 1992, 21).

Wholeness and interconnectedness operate within and across all dimensions of human experience and the natural world. A holistic perspective recognizes that we are physical, psychological, familial, social, economic, political, and spiritual beings. We are beings whose nature, origin, and purpose transcend our current theory and imagination (Kane 1992). Certain

cultures have long valued the tacit processes and outcomes of intuitive thinking, dreams, metaphors, and other such non-rational activity. Modern industrial and technological cultures, however, have stressed rational, analytical, and logical processes because they help to disaggregate, analyze, predict, and control (Maxfield 1990). Within and across the dimensions of experience, the process of synergy is fundamental: "the whole gives meaning to the parts" (Clark 1991, 44). The function of the whole becomes greater than the sum of the parts, "a result that is not predictable from an examination of the individual parts" (Gerber 1991, 44).

Clark (1991) believes that holistic thinking is supported by the three principles of unity, diversity, and interdependence. Unity refers to the interconnectedness of everything in an environment. Diversity refers to the mix of environmental qualities, functions, and species that are necessary for the stable operation of the environment. Interdependence refers to the complex set of communication, organizational, and other processes necessary for the environment to remain viable. Such principles are clearly illustrated in the ecology of the natural world (Berry 1988). Postman's use of the term "ecological" to explain the impact of technological change is a graphic illustration of the principles of unity, diversity, and interdependence at play in the natural world:

> Technological change is neither additive nor subtractive. It is ecological. I mean "ecological" in the same sense as the word is used by environmental scientists. One significant change generates total change. If you remove the caterpillars from a given habitat, you are not left with the same environment, and you have reconstituted the conditions of survival; the same is true if you add caterpillars to an environment that has had none. (Postman 1992, 18)

The use by distance educators of a holistic perspective to better understand the world of distance learning is, I think, as complex and challenging a task as it is for physicists (Bohm and Peat 1987; Bohm 1983), medical researchers (Sperry 1989), political administrators (Muller 1984), and literary scholars (Hayles 1991; 1990). Such a view does not indicate naive or romantic thinking; rather, it provides evidence of our open-mindedness and interest in developing our paradigms. As Kane points out, there is great effort involved in such activity. Such an effort is not romantic, for the possibility of "error and confusion is great; it requires both intellectual openness and integrity; it requires theoretical discourse, empirical research, and clinical articulation. As C. S. Lewis once wrote 'A warm heart does not mean a soft head' " (Kane 1992, 3).

The research into brain-mind-body functioning and brain hemisphericity has provided results of interest to educators (Maxfield 1990). Sperry's work, for example, shows how the two brain hemispheres operate in complementary, integrative ways, not in mutually exclusive ways (Sperry 1989). Gardner (1985) reinforces this idea of integration in his theory of multiple intelligences. Educators therefore have to be able to help learners process, store, and retrieve information in a variety of ways, not just in rational ones. Pribham's research suggests holographic, rather than mutually exclusive ways: "every part of the brain experiences and stores information that every

other part experiences, but each does so in a different way" (cited in Maxfield 1990, 101). Also associated with holistic education are the humanist education models of Maslow (1954) and Rogers (1983), because they focus on the well-rounded growth of individuals and the recognition of the relational elements in learning.

Consider how four contemporary educators define holistic education. Jack Miller places his focus on relationships: "between linear thinking and intuition, the relationship between mind and body, the relationship between various domains of knowledge, the relationship between the individual and community, and the relationship between self and Self" (Miller 1988, 3). Virginia Griffin (1989; 1990) uses the metaphor of making music on a six-string guitar, as distinct from a one-string instrument, to illustrate the richer, holistic results gained when all the available capabilities are used. She defines holistic education for adults in terms of the dynamics of learning, as

> a process that allows and encourages the unfolding of the whole person through provision of opportunities to develop rational, emotional, metaphoric (intuitive), relational, physical, and spiritual capabilities and to exercise them in various segments of his/her life (e.g., family, learning peers, work, community, environment/earth, world community, aesthetic world, cosmos). By becoming attuned to these capabilities as they operate in each of these settings, the learner is able to step back from him/herself to observe the unity and beauty of the "whole" of the human being. (Griffin 1990, 2–3)

Myles Horton relates the term holistic to an integrated content-process approach. He explains to Paulo Freire some of his adult education activity at the Highlander Folk School in Tennessee:

> We taught a lot of things that they needed to know...speeches...parliamentary law....But they also needed, we thought, a lot of other things. We tried to involve everybody in singing and doing drama and dancing and laughing and telling stories, because that's a part of their life. It's more of a holistic approach to education, not just a bunch of unrelated segments. (Horton and Freire 1990, 168–9)

Edward Clark sees holistic education in terms of its difference from the prevailing view:

> holistic education reflects an attitude, a philosophy, a world view that challenges the fragmented, reductionist, mechanistic, nationalistic assumptions of mainstream culture, and education. Because there are many synonyms for wholeness, there are many ways to characterize this perspective; holistic, ecological, evolutionary, spiritual, integrative, global. Whichever term one prefers, the ultimate purpose of holistic education is to transform the way we look at ourselves and our relationship to the world from a fragmented perspective to an integrative perspective. (Clark 1990, 5)

A recent researcher used psychosynthesis to develop a model of holistic learning having two cycles—decay and growth—which facilitate a Self-guided transformation, "the fundamental aim of which is to foster increasingly integrated and inclusive forms of identity and relatedness" (Chisholm 1993, 135). Other avenues to explore the origins and implications of holistic

approaches in education refer to certain philosophical and conceptual models and to general strategies for practitioners. Miller (1988) and Lemkow (1990), for example, explain how the holistic curriculum and wholeness in the world generally are based on the philosophy of perennialism. In this view it is argued that life has an all-pervasive unity and an ultimately unknowable, inexpressible equality: an "Absolute [that] transcends all apparent separateness.... Though it lies beyond all thought, it is not remote, but resides within the human heart" (Lemkow 1990, 23–24). These themes have recurred throughout human time, but have remained open enough to allow for development, hence the term perennialism. Perennialism is distinguished from atomism, which argues that reality can be reduced to very small and logical pieces of empirical data, and pragmatism, which argues that reality is constantly changing and is best dealt with by positivist scientific procedures of hypothesis-testing and problem-solving. In holism, by contrast, reality is an irreducible whole that is "harmonious and interconnected. Holism acknowledges the individual part and that things are in process; however, there is a fundamental unity underlying the process and connecting the parts" (Miller 1988, 18).

Three conceptual models—transmission, transaction, and transpersonal—have been used to define the holistic perspective in education (Miller 1988). The transmission model represents the one-way communication of knowledge to a recipient using the behaviorist stimulus-response mechanism. The transaction model incorporates the transmission model in its use of prior knowledge gained by transmission for the solving of problems and the construction of new, but individualized, knowledge schema. The transformation model uses both knowledge transmission and knowledge construction, but applies them in the multiple aspects of personal and societal change.

Strategies

In regard to general strategies for practitioners, holistic educators are concerned with all the dimensions, singularities and differences, and relationships within and between individual contexts (Wilkinson 1993; Drake et al. 1992; Miller, Cassie, and Drake 1990; Griffin 1989). Some important dimensions are the basic human conditions of being: development of the Self, maturity levels (psychosocial, affective, and cognitive), life-role constraints and resources, learning needs and skills, beliefs about knowledge production and ownership, influences of cultural background, and expectations about learning roles and responsibilities. Examples of singularities and differences include logic and intuition, concrete and abstract, cognition and affect, action and reflection, convergent and divergent thinking, values and procedures, quantitative and qualitative data, visible and invisible, spiritual and metaphoric, and the effect of parts and of the whole.

Relationships in a holistic context are comprehensive and interwoven; they include those within the self, between self and others, and between self and the societal and natural worlds. Lemkow uses an integrative prescription to convey her understanding of relationships:

> What students around the world need is an educational environment imbued with an understanding of the commonality of knowledge and experience that promotes seeing the interrelationship and the complementarity of science, philosophy, art and spirituality and that relates personal life to the social welfare. Students need also to understand the orders of nature and their relationship to and meaningful role vis-à-vis nature. (Lemkow 1990, 286)

Strategies specifically related to adult holistic learning are gaining increasing attention (Maxfield 1990; Griffin 1990, 1989; Smith 1988; Samples 1987; Melamed 1987; Ferguson 1987). These strategies focus on regulating consciousness; developing an alert, open, flexible mind in a physically relaxed body; accessing stored information; getting new ideas from old information; seeing the familiar as unfamiliar; and engaging in creativity. With adult learners, of course, educators have to confront such issues as the potentially inhibiting effects of self-concept and self-esteem in situations of growth or change, especially in cases in which new cognitive and affective connections are possible only by jettisoning old ones. Western adults generally have been socialized into the "acceptable" ways of thinking and talking about their worlds, i.e., in rational, logical, and analytical terms. I remember, for example, the first time I was taken through a demonstration of the Relaxation Response method in a graduate class; my initial skepticism was soon replaced by an appreciation for a new way of feeling that appeared to help me think better.

Twelve basic strategies seem most appropriate for adult learners:

- Using intuitive and creative thinking, not just analytical thinking (Denis and Richter 1987; von Oech 1986; Noddings and Shore 1984),
- Generating metaphors, analogies, and images (Samples 1979, 1987),
- Relating mind and body experiences (Miller 1988),
- Applying thematic and interdisciplinary treatments to the structuring of course content,
- Using multiple sources of information including autobiographical, artistic, and dramatic expression (Wilkinson 1993),
- Seeking patterns in similarities, cycles, tendencies, sequences, etc. (von Oech 1986) in real-life contexts or simulations,
- Legitimizing the positive and negative feelings associated with learning,
- Working in small peer groups without the "omniscient" presence of the teacher,
- Using a learning partnership for reflective activity (Robinson, Saberton, and Griffin 1985),
- Exploring with creative intent in libraries,
- Being in touch with one's own cultural heritage and respecting that of others (no country is 'the greatest in the world'),
- Legitimizing and using relaxed silences in groups, and
- Using first-person language to involve oneself and claim ownership of personal values, experience, and insights.

These and other strategies, of course, place significant demands on facilitators, tutors, and course designers, who must be willing and able to manage them. A further task would be to facilitate the deliberate development of learning-to-learn skills (for example, the set described by Collett 1990). The use of such a broad set of skills helps learners cope with the relational and personal-development aspects of learning (self-esteem, self-confidence, and respect for others) as well as the cognitive aspects. Information processing skills would have to include the Melamed-developed concept of playfulness and other experiential skills to gather information from concrete experience, as well as to think in abstractions and process information via reflective observation and active experimentation (Kolb 1984). If my own experience is any guide, adults who are busy juggling the demands of multiple life roles may need some encouragement to deliberately take time out for themselves—to rest and to get away from the avalanche of daily information so that their minds and emotions can prepare to be creative and playful, without feeling that they are silly or wasting precious time. Such creativity in learning may be difficult to establish for adults who are subject to various traditional stressors and/or who have negative preconceptions about learning.

Distance Learning in a Holistic Perspective

What relevance does a holistic approach have for distance learning? First, our field will be strengthened conceptually and practically if we examine ideas currently under discussion by our peers in other professional fields. Although I have yet to see any discussion about holistic learning per se in the distance education literature, the educators' universe is potentially as interdependent, diverse, and unified as the biological universe. Second, since many distance educators depend on interactive technologies of one kind or another, our philosophical and conceptual horizons may shrink to accommodate preoccupations with practical decisions related to the application of technologies. The "high tech" approach can be most seductive: it can claim our attention and energy for issues other than the fundamental ones of the role of learning in the growth and maturation of people. Technology groups people in a technical sense, but does not necessarily connect them in cognitive and affective ways. Another concern regarding technology is with the built-in emphasis in much software on linearity and logic, which appeals to our rational capability (Lamy 1993).

Finally, a holistic approach might help us deal with a concern about our research efforts. The best analogy for this concern comes from the world of the imagination. Philip Jackson used the marrow bone analogy from a Yeats poem to argue for educational research results that are complex

and challenging because they relate to the deepest elements of what it means to be human. Such results require

> that we conscientiously explore our most deeply held assumptions and presuppositions and that we do so with directness, a candor, and a tenacity that has seldom typified our work in the past. It was Yeats (1958) who said "God guard me from those thoughts men think/In the mind alone; He that sings a lasting song/Thinks in a marrow bone" (p. 236). Yeats's prayerful entreaty issued from the soul of a poet, yet its truth, it seems to me, applies to us all. (Jackson 1990, 9)

The spiritual, the intuitive, and the affective, as well as the rational elements, have to be considered if we are to produce research results that illuminate the complexity of the human condition. Since research paradigms guide decisions about the value and origins of knowledge, they have to be chosen and used with full awareness of their assumptions and limitations. The naturalistic paradigm with its qualitative methodologies, for example, must play a stronger role in distance education research if we are to generate rich descriptions of the diversity, unity, and interdependence of the human condition (Burge 1992). Distance education, as Morgan (1990) has so clearly shown, contains a number of factors and issues that work against the adoption of naturalistic and critical research approaches, not the least of which is the entrenchment of educational technology in course design. And much of educational technology is based on systematic ways of planning structured, controlled environments for learning, environments not necessarily conducive to holistic approaches. David Harris's (1987) controversial critiques of course design models in The Open University (UK) and the editorial work of Evans and Nation (1989, 1993) provide us with germinal reflections on practice. Some of these reflections show us distance educators who are very much connected to the multiple layers and events in their environments.

Two metaphors of research practices have had a significant impact on me because they illustrate so well the two opposing ways in which researchers may connect with their contexts. One metaphor is that of the researcher's "commando raid" into a setting (Eisner 1988, 19), an intrusion that takes little or no account of the inherent and often invisible contextual subtleties and the consequent impact of the "raiders" on that context. The second metaphor, from Elspeth Huxley's autobiographical novel *The Flame Trees of Thika,* shows how a researcher may use a diametrically opposite stance to connect with a context:

> The best way to find things out is not to ask questions at all. If you fire off a question, it is like firing off a gun—bang it goes, and everything takes flight and runs for shelter. But if you sit quite still and pretend not to be looking, all the little facts will come and peck round your feet, situations will venture forth from thickets, and intentions will creep out and sun themselves on a stone; and if you are very patient, you will see and understand a great deal more than a man with a gun does. (Huxley 1959, 248)

This stance, gives me a better opportunity to develop "marrow-bone" understandings of how humans interact with their environments and how they develop identities and autonomy from their interdependent relationships with their environment (Lemkow 1990). We already know some things about learners, e.g., demographics, educational orientations, drop-out rates, course completion rates, and reasons for persisting or dropping out. But we know very little about such marrow-bone factors as learners' perceptions of how they learn; highs and lows in learning; unexpected events; stages and patterns in energy use; insights; discomforts; etc. Until we have more of this kind of data, we are of necessity limited in our ability to generate creative questions for our own further research and in our ability to strengthen links with other educators.

Promoting Holistic Perspectives

If it is agreed that we might usefully explore holistic approaches to designing and researching distance learning, how then can we promote these approaches? The following six suggestions might serve as guidelines.

First, we might critically examine our professional language, for it conditions our thinking and our dialogue about that thinking. In examining this language we should

- Seek connectedness in practice by developing partnerships in concepts. Talk not only of delivery of information, but also dialogue about that information. Refer not only to cognitive achievement by learners, but also to affective and affiliative achievement. Use intuitive as well as rational thought; celebrate intuitive insights for their own sake, rather than as a poor substitute for analytical procedures. Help learners to use a holistic thinking style, not just a serialist one (Pask 1988). Recognize play as a sophisticated form of learning (Melamed 1987) that differs qualitatively from 'having fun.'

- Examine the metaphors and images we use (Haughey 1991). Metaphors are a powerful way of conveying meaning because they are holistic: we may understand more about all the nuances and relational dynamics of a setting as presented in the single word or phrase of a metaphor than in lines of prose. For example, some students I know think that the metaphor of "white water rafting" appropriately captures the feelings of dealing with the volume and speed of messages in a class mediated by computer conferencing (Burge 1993). In distance education we can look beyond the "loop" image of the teacher-learner interaction frame (Shale 1988) and think instead of the image of "spaghetti" as reflecting the tangled time- and context-bound connective threads of interaction among people and material resources. We can avoid thinking of peer discussions in such combative terms as "the cut and thrust of academic debate" (heard in a distance education conference) and instead talk to each other as authentic, open-minded individuals (as distinct from well-defended, self-aggrandizing ones) who connect with and articulate the personal values, feelings, and biases that influence our work as practitioners and researchers.

- Examine our terminology for its applied and theoretical potential for promoting unity, diversity, and interdependence. Moore, for example, accomplished this end with the term "transactional distance" (Moore 1983). I have made one try at analyzing the term "dialogue"

to identify more of its dimensions in adult learning contexts (Burge and Haughey 1993). Senge (1990, 240) explains how the eminent physicist Bohm developed a holistic concept of dialogue and distinguished it from discussion, which is likened to a "Ping-Pong game where we are hitting the ball back and forth between us." Dialogue, by comparison, is based in the collective, irreducible, and always changing wisdom of the group and enables the members to see and use their inconsistencies of thought without fear of negative consequences. In such situations, there is no talking past others, or scoring points, or defending territory; there is, instead, the recognition that the thoughts of individuals are grounded in the collective, thereby releasing energies for creative and risk-taking expression. There is a big challenge here for us: How can we facilitate the conditions for such dialogue? We certainly would have to confront the usefulness of those ubiquitous words "support" and "control." Might they be re-defined by our developing holistic understandings of how our learners maintain their expressive environments and deal with our interventions (Kirkup and von Prümmer 1990)?

- Discard terms that perpetuate the exclusions and fragmentations caused by sexism, racism, ageism, and cultural stereotypes. Many sets of guidelines now exist (cf. Eichler 1988; American Psychological Association 1983). Discard also those words that carry connotations of an educator-centric world. An example of this perspective is the phrase "adults returning to school," which I heard a senior government official using until someone pointed out that such a phrase may be neither appropriate in terms of adult-preferred locations for learning nor encouraging in terms of memories of school days as a child. Actively look for gender-based behavior differences that overarch the age- and culture-based issues in learning. Maccoby, for example, argues that social behavior "is never a function of the individual alone...Individuals behave differently with different partners. There are certain important ways in which gender is implicated in social behavior—ways that may be obscured or missed altogether when behavior is summed across all categories of social partners" (Maccoby 1990, 513).

We should also pay more attention to research that deals specifically with women, who constitute more than half our learner population. The work of Belenky and her colleagues (1986) was a landmark for our understanding of how knowledge is produced and construed, especially regarding connections to self and others' knowledge and experience, and regarding ownership and use of knowledge. As a whole, the distance education literature pays comparatively little serious attention to gender differences, despite important work being done by practitioners and researchers (cf. Grace 1991; Kirkup and von Prümmer 1990; Coats 1989; Faith 1988). Just how serious are the gender-based problems in distance education? How are women's views both legitimized and celebrated, before being connected with and used for the survival and growth of the universe, as Thomas Berry (1988) has asked so eloquently?

A second way to promote a holistic perspective might be through the use of transformative models of teaching and learning. Such models value personal growth, facilitate significant changes in perceptions, and promote critical cognitive abilities (Baxter Magolda 1992; Mezirow 1991). Mezirow developed his transformation theory about how adults can develop by challenging their old assumptions and creating new meaning perspectives that are "more inclusive, integrative, discriminating, and open to alternative points of view" (Mezirow 1991, 224). His theory differs

from stimulus-response mechanisms or cognitive science and information processing theories; such approaches, Mezirow argues, are of limited use in the facilitation of significant learning for adults (1991, 7). The concern of some educators with transformative learning focuses on the difficulty of helping learners move from relative passivity, dependence, and silence to pro-activity, interdependence, and self-expression (Burge and Haughey 1993; Modra 1989); such efforts are not easy to implement.

Reflection on our practice is a third way to increase our awareness of relationships and unities. Patterns of activity and connections may become apparent in the relative calm of recollection and analysis. Interactions and consequences that may have been lost in the "heat" of the interactive moment or subsequently quashed by psychological defense mechanisms stand a chance of being retrieved. The work of Connelly and Clandinin (1988), Hunt (1987, 1992), Newman (1991), Schön (1983, 1992), and Witherell and Noddings (1991), for example, has helped me to reflect by legitimizing the process of reflection and showing how others have drawn out the connections and paradoxes in their experience. David Hunt, for example, divides our personally experienced knowledge into three forms: self awareness, implicit theories, and images. All three need certain strategies for release. One strategy for identifying personal images, for example, is to quickly construct an image of oneself as a practicing educator or researcher and then examine this image for connections, incongruities, and surprises. Another strategy is the use of narrative, "a structure that organizes events and human actions into a whole, thereby attributing significance to individual actions and events according to their effect on the whole" (Polkinghorne 1988, 18). Witherell and Noddings add some passion to their understanding of narrative:

> Stories can join the worlds of thought and feeling, and they give special voice to the feminine side of human experience—to the power of emotion, intuition, and relationships in human lives. They frequently reveal dilemmas of human caring and conflict, illuminating with the rich, vibrant language of feeling the various landscapes in which we meet the other morally. (Witherell and Noddings 1991, 4)

Narratives help me to connect with my own or others' participation in a past event or process as an initial step in connecting with issues, values, and paradoxes. The Open University (UK) Staff Development Team selected the following tender, but powerful, "marrow bone" narrative to illustrate how one adult educator grew by being open to the immediate context and willing to reflect on it later.

What I learned that evening...

In the autumn of 1970 I was a very young tutor, teaching a preparatory class for some of the first students of the OU, due to begin A100 in 1971. They were a mixed lot, all older than I,

indescribably keen. I'd never taught adults before and I was intoxicated by this new experience of students who rejoiced in the subject—literature—and couldn't get enough of it.

We were reading "On My First Sonne" by Ben Jonson, a tender, despairing cry of pain on the death of his seven-year-old boy. I talked happily of metre, rhythm, syntax, poetic and personal voice, complication within apparent simplicity—and all at once became aware that one student, a man in his sixties, was silently weeping, the tears seeping between the fingers of the hand which covered his face.

I was appalled, and quite lost: I couldn't handle this sudden and terrible shift from the analysis of a poem to the reality of personal grief—for of course, he too had lost a boy, many years ago, before I was born. As I sat silent, the other students moved closer to him. One man held him for a moment, and then gently guided him out of the room. The other students began to talk quietly about children and about grief, until, after a long while, he came back and we went on.

What I learned that evening—of the power of poetry, of the directness with which adult students apply what they are learning to their own lives, of the care that mature people show for one another in such circumstances—has stayed with me ever since and helped to form me as a teacher. (The Open University 1988, 18)

A fourth way to promote holistic approaches is to look for expected and unexpected patterns and dynamics in settings, without regarding them as irrelevant "noise" or unhelpful "messiness." Such details may indicate patterns not easily seen at the beginning, or patterns that change somewhat through iteration, or patterns having qualities that do not reflect convention (often a construct of the dominant members of society). For example, Virginia Woolf asked in her novel *The Years*, "Does everything then come over again a little differently?...Is there a pattern, a theme, recurring like music; half remembered, half foreseen?" (Woolf 1965, 269). Lanie Melamed, in her research into playfulness in adult learning, discovered that one of the five qualities of playfulness was an integrative one, often shown in the "organic" metaphors used by the interviewees: "the patterns which seem to shape their lives are cyclical, ecological, and relational. Flow, flexibility, the complex and the unresolved are preferred to precision, predictability, control and order" (Melamed 1987, 21).

Unexpected or mysterious dynamics may create processes that destabilize, fluctuate, and restabilize the elements in the context. The origin or ultimate impact of these processes are not necessarily predictable, as the expanding literature on dynamical systems, or chaos theory, helps us realize (Gleick 1987). Briggs and Peat explain some of the dynamics:

> Complex systems—both chaotic and orderly ones—are ultimately unanalyzable, irreducible into parts, because the parts are constantly being folded into each other by interactions and feedback....Any interaction takes place in the larger system and the system as a whole is constantly changing, bifurcating, iterating. (Briggs and Peat 1989, 147)

Chaos theory explores complex systems not as lacking in order, but as rich in information that can reveal very particular patterns and regularities. Hayles refers to the metaphors of a clock and a

waterfall to illustrate a change in how the world is perceived: no longer in terms of the mechanistic and precise operation of a clock, but rather in terms of unpredictability and turbulence (Hayles 1991, 8). We do not yet know how chaos theory actually works in social science and humanities settings, nor do we have the measuring methods and skills to apply the theory adequately (Griffiths, Hart, and Blair 1991); however, even initial reactions show some promise (Cziko 1989; Hayles 1990, 1991). Several colleagues and I see intuitive value in applying chaos theory to our thinking about distance education. If we look at how a whole system operates over a period of time (and not just at its presenting or initial conditions and dynamics) we may find evidence of some or all of the characteristics of chaotic systems that could explain apparently unconnected or unpredictable events.

Within chaos theory, five characteristics have been discussed at some length (cf. Hayles 1991, 1990 for an exceptionally lucid explanation). The first characteristic is the non-linearity of relationships: small causes lead to big, not small, consequences. The second is sensitivity to initial conditions; the most innocuous event could have been the trigger for a later set of significant events elsewhere (the butterfly effect). The third characteristic is the existence of an attractor: "any point of a system's cycle that seems to attract the system to it" (Hayles 1991, 8), or "a common element or force that emerges over and over as a central component around which events revolve" (Griffiths, Hart, and Blair 1991, 441). A simple attractor, for example, is the mid-point of the predictable swing of the pendulum in a clock. A strange attractor, on the other hand, "combines pattern with unpredictability, confinement with orbits that never repeat themselves" (Hayles 1991, 9). Something is creating a divergence in the motion to render the path of travel unpredictable. An easy example is the desk toy for frazzled office workers: a pendulum with a set of magnets under the flat base that pull the pendulum out of its regular left-right-left motion into irregular patterns that defy a predictable path. The fourth characteristic is recursive symmetries: "the same general form is repeated across many different length scales, as though the form were being progressively enlarged or diminished. Railroad ties disappearing into the distance have this property" (Hayles 1991, 10). The fifth characteristic is based on fractal geometry, which shows fractions of the base measurements of a form in succeeding versions of that form. One example is the way in which the basic shapes of a continent's coastline are repeated in smaller, localized forms of the geography as one's perspective narrows.

Chaos theory is currently being applied in two approaches to a host of different disciplines (Hayles 1990, 1991; Griffiths, Hart, and Blair 1991; Lemkow 1990). One approach is to examine the self-organization and ordering that comes as a result of the operation of a chaotic system; the other approach is to identify the patterns and ordering that exist within a chaotic system (Hayles 1990, 9). These approaches need to be thought about in terms of the five characteristics of complex dynamic systems (chaos). After first reading about chaos, I instantly felt that it had intuitive value

for my thinking about my life as experienced internally; my professional, external relationships; and events of distance education. But now, of course, I have to apply rational thought to help me understand my initial intuitive response. At the International Council for Distance Education (ICDE) conference in Caracas in 1990, David Murphy and I explored chaos theory in a stimulating session with colleagues. We left that session wishing for more dialogue and exploration. Murphy has since used chaos ideas to reflect on a course development process (Murphy and Taylor 1992) that, contrary to the neat prescriptions of technologists, was a rather "muddy" process filled with "confusion, ambiguity, and uncertainty." Now we both wonder about the extent to which distance learning aspects may be explained either metaphorically or quantitatively, guided by scholars of chaos theory. Some of our students and some of us educators, in fact, relish the muddiness in the eddies and currents of learning and educating. We happily "slosh around," for example, in the uncertainties of predicting how a set of initial conditions may influence future events, or in trying to figure out how a situation—either a person's life context or an institution—begins to show some self-organization out of apparent disorganization; we are interested not in control but rather in new ways of looking at complex wholes.

How then might thinking in chaos terms promote holistic approaches? We could, for example, take topics of interest and re-vision them in chaos frameworks to look for new predictions, explanations, or hypotheses regarding drop-out rates, learner success, learning processes, course-team operation, program design and evaluation, or adoption of new technologies. Drop-out, for example, may be explainable in terms of sensitivity to initial conditions. We could look differently at initial conditions in any situation and speculate that they may not be the cause of later events. We could look for those elements (attractors) that become the center around which various forces revolve: do attractors operate in small group discussions? We could accept with equanimity unexpected learning events and outcomes and look for contexts in which those events or conditions may reoccur. Above all, we could look for connections where they may not be initially evident.

The fifth suggestion for promoting a holistic approach is to try to use various practical strategies. How many of the strategies listed earlier might be appropriate in various distance learning contexts? How can we facilitate intuitive thinking? How can we help learners take some unfamiliar, challenging, or additional paths around a topic, or explore the ground in figure-ground relationships? A moose-hunting-style analogy provides a useful approach. Marge Denis explained that an Aboriginal Canadian friend once told her that, in his culture, "We think the way we hunt moose. Never in a straight line because then the moose knows where you are. You go around and around the moose, coming closer all the time until you finally close in on him" (Denis and Richter 1987, 25).

How do we encourage imaginative, multi-mode assignments when we expect that grading such work will add to work overload? Will the new three Rs—recession, retrenchment, and

restructuring—strengthen the political clout of those who would go back to traditional "drill and fill" methods? How does one facilitate serendipitous browsing through online library catalogues and databases? What would be the political and administrative consequences of allowing tutors and learners freedom to use creative ways of presenting evidence of learning, knowing that such activity may create unease about the "academic rigor" of the course? How can we redesign our professional development activities so that they provoke us to think in new paradigms and change our habitual forms of expressing those thoughts? How may we promote inclusion and interconnectedness?

The sixth and final suggestion to promote holistic thinking is an integrative and reflective one: a call for more research questions, paradigms, and methodologies that focus on identifying the components that create maximum diversity in a context, the processes that illustrate interdependence and unpredictability in a setting, the connections that promote unity and wholeness, and the consequences that create a whole that is irreducible, i.e., bigger than the sum of its parts. We should attempt to synthesize as well as analyze, to look for what is not obvious at first glance or on first analysis.

In more specific terms, we could ask some questions about the quality of the experience of learning (Cookson 1989) as it relates to individuals alone and in groups. We could inquire into how personal autonomy is developed as a function of interdependence with the context. We could legitimize and use the stages of cognitive and affective destabilization and restabilization that happen in significant learning. We could design learning and tutoring activity that overtly refers to Griffin's six personal capabilities: the rational, emotional, spiritual, relational, physical, and metaphoric capabilities (1990). We could tackle the question of how to help individual learners in isolated environments (which may be caused by illness, cultural or gender-based socializations, or geographical distance) to see how their experience and values and needs may be connected to a wider universe of ideas and feelings.

If you agree that the holistic approach to education has some use for us, then let's role model the holistic approach. Let's begin a dialogue of the kind that Senge (1990) outlined, in which

> a group explores complex difficult issues from many points of view. Individuals suspend their assumptions but they communicate their assumptions freely. The result...brings to the surface the full depth of people's experience and thought, and yet can move beyond their individual views. (p. 241)

If we talk in a mental state of relaxed attentiveness, we ought to gain access to new ways of knowing about information and feelings. In Elspeth Huxley's words, we might see new facts peck at our feet, new situations emerge from thickets, and new intentions aired—all in the sunlight of a holistic perspective.

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A Paradigm for Generating Curriculum Design Oriented Research Questions in Distance Education

Francis M. Dwyer

Introduction

"It is not possible to develop quality instructional materials for random groups of learners."

If this hypothesis is true, how does it affect the design of courses delivered via distance education? What research questions need to be addressed to positively affect the development of quality instructional materials for distance education? Answering these questions requires first defining what is meant by quality instructional materials. Under some circumstances merely informing learners or making them aware of the existence of certain types of information can be considered quality instruction; however, for the purposes of this paper quality instruction is that which allows learners to proceed through an intellectual progression (hierarchical relationship) involving the learning of facts, concepts, rules/principles, and problem solving. What "content area" does not have as its ultimate goal to produce individuals who are problem solvers? Is there a discipline in which a learner can successfully participate in problem solving without having a working knowledge of the prerequisite rules/principles, concepts, and factual information upon which the discipline is founded? It is generally agreed that, for successful acquisition of different levels of learning, learners need to instigate and participate in different levels of information processing. It is also generally understood that success at each level of learning depends on the existence within the learner and the external environment of conditions conducive to the specific type of learning (Gagné, Briggs, and Wager 1988). For example, learners cannot achieve the level of rule/principle application if they do not possess the conceptal base for such development, or if the instructional experience does not provide the appropriate in-depth rehearsal or information processing necessary for them to bring together the relevant concepts in a manner that facilitates rule/principle application.

Individual Differences

What is the relationship between instruction and the individual learner? The essence of this question has been the focus of scholarly writing and research for almost a century. The psychological literature consistently indicates that an individual's prior knowledge is a critical

instructional variable affecting subsequent learning, comprehension, and memory (Ausubel 1968). Current cognitive theory (Cook and Mayer 1983) assumes that the learner comes to the learning environment with a vast repertoire of existing knowledge that constitutes the internal schema of meaningful networks that directly influence the subsequent learning of new domain-related information (Voss 1978; Gagné 1985; Rissland 1985). Both Lewin (1935, 1936) and Gilbert (1978) have provided conceptualizations indicating that the learner's life space, including prior knowledge and experience, governs to a significant degree what the learner is capable of attaining (processing) and the rate at which the attainment and processing of new information can be realized. Our early conceptions of the learning process as a uni-directional, narrow-band or single-channel flow of information has changed radically. We now think in terms of fields and interacting systems of information, and, in turn, with the interactions of these varied systems of information with learners (Knowles 1980). Learners not only react to but also act on the selectively perceived systems and forms of instruction. They bring to bear on the learning environment relevant parts of their life histories, accumulated knowledge, and experience to modify, counteract, emphasize, and even distort the perceived information. Consequently, the responses learners make to intended instructional messages vary greatly. In order to design effective distance education instruction, we need not only demographic information such as learners' sex and age, but also information about their individual ability patterns (e.g., I.Q., prior knowledge, reading/oral comprehension rate) (Dwyer 1978, 1987); their active and latent interests; their value systems, biases, and prejudices; their total grids of selective perceiving; and their many ways of acting on and responding to the information presented.

In view of these circumstances, the desired outcomes of instruction, even when carefully prescribed and delivered, may not be achieved because of the complex combination and interaction of influences that occur within individuals and within specific settings. Ultimately, what is learned depends on how learners process the incoming information and how they relate it to what is already known. Additionally, the quality and the quantity of the learning is dependent on the nature of the task (the level at which the information is to be processed), what the learner already knows (level of prerequisite learning), what the learner actually does during the instruction (listens, reads, outlines, summarizes, generates, reacts to feedback, etc.), and the amount of time the learner actually spends interacting with and processing the intended information.

Instructional Consistency/Congruency

Learning may be described as a highly complex set of psychological activities, and instruction as the complex set of activities that educators design, develop, and deliver to learners to address the

psychological variables of learning. Acknowledging the individual differences among learners and differences in levels of learning, what strategies will generate research questions leading to the development of guidelines for curricular and software development in distance education or for any other type of education/training?

Instructional consistency/congruency paradigms (Canelos 1983) present a basic conceptualization of how individual differences can be accounted for in the design and development of instructional materials for use in distance education. The following sample question from an instructional unit designed to enable learners to respond successfully to a series of questions dealing with the functions of the human heart provides an example of this process:

> When the blood in the aorta is exerting a superior pressure on the aorta valve, what is the position of the mitral valve?
>
> a. closed
> b. open
> c. partially open
> d. partially closed

What do learners need to know to answer this type of question correctly? They need to know the parts of the heart (facts), the respective locations and functions (concepts) of these parts, and the respective functions during the diastolic and systolic phases of the heart (principles/rules). For learners unfamiliar with the content, the instructional module should provide those experiences that will enable them to 1) acquire the factual information, 2) "synthesize" the factual information into concepts, and 3) integrate the concepts into functional principles and rules that can be used in problem solving. Figure 1 illustrates a basic instructional consistency/congruency matrix.

	Objectives	Instruction	Testing
Problem Solving			
Rule/Principle Using			
Concepts			
Facts			

Figure 1. Instructional Consistency/Congruency Matrix

Initially, the matrix requires the instructor to inspect the content to make sure that the instructional material contains the appropriate facts, concepts, and/or rules and principles that are prerequisites for learners to process the information at the intended level. This information is usually presented in the design phase of the instructional development process and is reflected in the instructional curriculum map (ICM) (Briggs and Wager 1981). The instructional consistency

concept verifies that the prerequisite kinds of learning are present in the instruction. For example, if one is teaching for rule/principle application, the consistency continuum ensures that the appropriate concepts and factual material have also been included in the content to be taught. Its structure also requires a specific statement of the objectives in each category. This step is of significant value because it alerts the designer to the fact that the learners are going to be processing information at different intellectual levels and that appropriate types of instructional experiences (rehearsal strategies) need to be developed to facilitate the different levels of learning. Inherent in the design and development of these instructional experiences are the concepts associated with utility and cost effectiveness (these issues have been previously presented and documented at the First American Symposium on Research in Distance Education, Dwyer 1990).

The instructional congruency aspect of the matrix requires the designer of the instructional content to 1) prepare objectives that are clearly defined, 2) design test items that specifically measure the objectives, and 3) provide the kind of instructional experience that will instigate in the learner the appropriate level of information processing necessary to acquire the information sought in the test item and, subsequently, to satisfy the specific instructional objectives. Figure 2 depicts a situation in which the objective to be taught is at the rule/principle level. The instructional experience has been designed to instigate the depth of information processing necessary for the learner to acquire the intended information and the test item has been designed to measure specifically the type of learning specified in the objective and taught in the instruction.

	Objectives	Instruction	Testing
Problem Solving			
Rule/Principle Using	X	X	X
Concepts			
Facts			

Figure 2. Instructional Consistency/Congruency Matrix: Congruency

Figure 3 illustrates a situation in which the objectives were written at the concept level and the instructional experiences were designed specifically to facilitate concept information acquisition. However, the testing was implemented at the rule/principle level. This incongruency usually results in poor performance and frustrated students.

Figure 4 presents a different kind of mismatch. Here the objective was stated at the rule/principle level and the instruction was also intended to facilitate information processing at this level; however, the testing was designed and implemented at the concept level. Testing performance in this situation is usually good, but excessively expensive. It generally costs more to

design educational experiences which instigate the higher levels of information processing, and, in this case, where the testing occurred at the concept level, we have no way of knowing whether the rule/principle-using objective has been achieved.

Instructional Consistency	Objectives	Instruction	Testing
Problem Solving			
Rule/Principle Using			X
Concepts	X	X	
Facts			

Instructional Congruency

Figure 3. Instructional Consistency/Congruency Matrix: Mismatch

Instructional Consistency	Objectives	Instruction	Testing
Problem Solving			
Rule/Principle Using	X	X	
Concepts			X
Facts			

Instructional Congruency

Figure 4. Instructional Consistency/Congruency Matrix: Mismatch

Summary

Learning can be thought of as the mental processing of information from the environment. However, there are different ways of processing similar types of information, which yield different types and/or levels of learning: facts, concepts, rule/principle using, problem solving (Bloom 1956 and Gagné, Briggs, and Wager 1988 have provided more complex learning hierarchies). These distinct learning types are observable in terms of learner performance when learners encounter new

information. In other words, learners exposed to new information can be expected to acquire progressively more complex intellectual skills contingent on the level of their prior knowledge and the complexity of the new information. Whereas learners who have a good conceptual base in the content area would be expected to acquire rule/principle-using skills under normal conditions, it is inconceivable that learners with weak conceptual bases in a content area would make normal progress in mastering rule/principle use. Thus, those designing course content that is intellectual in nature (representing a hierarchy of different types of learning levels) must match the instructional design of the content with the information processing level of the learners.

We know that when new information is appropriately matched to the learner's level of information processing it is

> "acted upon" in a meaningful way in short-term memory, enters long-term memory and subsequently becomes part of the learner's database (schemata) that can be used for more complex information processing. If information is not moved into long-term memory it is dropped from short-term memory and is readily forgotten, since only limited amounts of information can be held in short-term memory. It has been found, however, that if it is possible to hold information in short-term memory for extended periods of time, more will be processed and placed in long-term memory (Fisher and Craik 1977; Shephard and Podgorny 1978). Information is generally held in the learner's short-term memory through the use of different types of rehearsal strategies (e.g., cueing, advanced organizers, questions, color coding, animation, overt response, etc.). The role of the designer of effective learning experiences, to be used either for conventional-type instruction or distance education, is one of manipulating the instructional environment so that learners will act on information in short-term memory initially and long-term memory subsequently in ways that will enable them to process information at levels commensurate with that which is necessary for them to achieve the different types of educational objectives (Dwyer 1990, 222–23).

Future Research

There exists in the instructional environment factors that dictate the level of information processing in which learners are prepared to engage. There are also different kinds of learning experiences that can be designed to instigate different levels of information processing. Most designers of instructional software implicitly or explicitly assume that instruction must be initiated at the learners' existing knowledge structure and that learning outcomes depend on the educational activities in which the learners participate during the learning task. In this regard, Reed and Sork (1990, 36) have indicated that "the learner in distance education is more dependent on course materials than are learners who participate in face-to-face instructional programs." In emphasizing this point, Garrison (1990) indicates that

> little attention has been given to the teaching/learning process and to understanding the essential nature of an educational learning experience. The danger of an overemphasis on sophisticated packaging of content...is the risk of artificially separating information into uniform, but over-simplified categories that show little resemblance to reality or the needs of learners. (P. 14)

Any programmatic research effort designed to facilitate the development of effective software for distance education should provide the designer with a matrix to illustrate which types of specifically-designed, interactive-feedback experiences or rehearsal strategies (Dwyer 1990) would be most effective in instigating the type of information processing necessary for specific types of learners to achieve at the different levels of learning (e.g., factual, conceptual, rule/principal using, problem solving). Research centered around the instructional consistency/congruency paradigm and using item analysis would enable this objective to be realized. This matrix would enable designers to look at content, make a determination as to the expected level of learning (facts, concepts, rule/principle using, problem solving), and select the instructional design strategy having the greatest predictability of facilitating the designated achievement. Obviously, there would be a number of matrices depending on the number of critical individual difference variables identified as having a potential impact on learning. One such critical dimension would be prior knowledge in the content area, since it has been well established that effective learning can occur only if it is meaningful and is related to what is already known. The initial phase of such a research effort, using prior knowledge as the critical variable, would present a hierarchically oriented instructional sequence (containing factual, conceptual, rule/principle, and problem solving levels of learning) to learners who were unfamiliar with the content. After being given an opportunity to interact with the "control content," their learning would be evaluated and subjected to item analysis. This procedure would identify specific areas of learning difficulty among the levels of learning and provide the rationale for systematically positioning interactive-feedback experiences to facilitate learning. Adherence to this systematic and meticulous procedure of juxtaposing and evaluating the effectiveness with which different interactive-feedback strategies facilitate different types of learning would result in the development of a decision matrix for the design of instructional content. The goal of instruction would be to take learners being introduced to a new content area from the factual through the problem solving stage. Once developed, this matrix would also be useful in prescribing to designers those interactive-feedback experiences to be used with learners who already possess content competencies at one level and who desire to move to the next higher level of content competency.

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Systems Analysis of Integrated Distance Education By Discourse

Farhad Saba

Background

At the First American Symposium on Research in Distance Education held in 1988, I presented a paper which received the attention of my colleagues beyond my expectations. The paper was based on Moore's (1983) two dimensional model of distance education defined by three concepts of structure, dialogue, and learner autonomy. My contribution was to apply System Dynamics methodology to further clarify the model in terms of a formal dynamic relationship between dialogue and structure. A major aspect of my work since the First Symposium has focused on determining an appropriate method for data collection on each system component. For example, I had to determine the best way to measure the rate and level of dialogue and structure at any particular time interval in an instructional session. This paper is a progress report on

- the selection of discourse analysis as a useful method of data collection for developing valid and reliable dynamic models of distance education, and
- future plans for continuing dynamic analysis of integrated distance education systems.

A Dynamic Model of Distance Education

Model building as a method of theory development is a process of gradual approximation. A map will never be identical to the territory; one can only hope that it will facilitate understanding and navigation of the territory. The basic system model presented in 1988 proposed a dynamic relationship between structure and dialogue as illustrated in Figure 1.

It was proposed that in integrated systems

> as dialogue increases, structure decreases and as structure decreases, dialogue increases to keep the system stable....In a plausible scenario, the need for decreasing structure is communicated to the teacher. Consultation automatically increases dialogue; then adjustments in goals, instructional materials, and evaluation procedures occur and the learner achieves the desired level of autonomy. (Saba 1990, 350)

Learner autonomy was considered the goal of the system. This goal is based on the democratic tradition of Western society; the dramatic events in Eastern Europe since the first meeting of this Symposium; and the democratic desires of the people of the Third World, where the expression of such desires can be heard amidst historic events. McComb's (1989) study of the concept of dialogue in light of the liberal democratic aims of education as espoused, for example, by Dewey, is useful in this regard. These aims included educating people to participate in society as active creators rather than passive reactors and to be fully capable of making conscious choices in moral and political domains by critically participating in a liberal democracy.

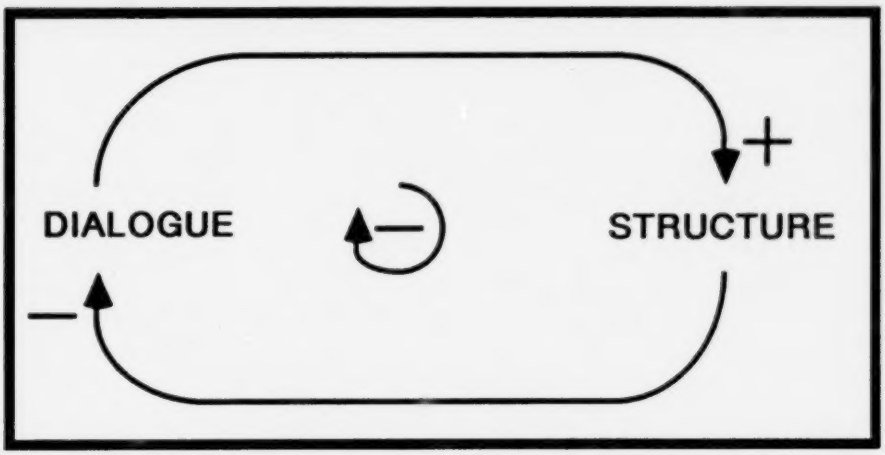

Figure 1. Causal Loop Diagram of Transactional Distance

The level of autonomy, however, may vary according to the level of structure determined by factors such as the age of the learner or the nature of the content. Casual observation shows that learner autonomy may have to be in proportion to learner maturity. Also, the nature of content may require a certain amount of structure. For example, a course in computer programming may be more structured than a course in current issues in international relations. These are experimental questions that should be resolved by measuring the *level* and *rate* of dialogue and structure to develop valid and reliable models.

In educational systems measuring, system components are not as self evident as in industrial or natural systems. System Dynamics initially was developed for analyzing general systems. At the outset, it was applied to the analysis and understanding of industrial systems (Forrester 1961). Later it was used for inquiry into a variety of other systems ranging from the ecological to the social (Meadows and Robinson 1985; Roberts et al. 1983). In many of these models, the type of data to be collected was determined by the nature of the variable. For example, the most famous application of System Dynamics methodology was an attempt to understand the future of our planet

better. In that process of model building, system components determined the method of data collection (Forrester 1973). System components such as Earth's population, air pollution, land available for agriculture, land available for living quarters, etc. determined how each system parameter should be measured.

Discourse Analysis as a Means of Data Collection

The system model was initially proposed in the First Symposium as a means of measuring variables in natural systems or even in industrial systems rather than as a means for measuring dialogue or structure. Since then, a careful review of theoretical literature suggested two reasons for considering discourse analysis as an appropriate method of data collection for determining *level* and *rate* of dialogue.

First, there seemed to be adequate justification to believe that social construction of meaning through dialogue (discourse) was of theoretical significance for understanding interactions of teaching and learning. Moore's (1989) description of three types of interaction applies to social discourse in at least two categories: instructor/learner interaction and learner/learner interaction. Learner/content interaction may be private. Shale (1990), however, considers education as a social process for validation of private knowledge: "In order to validate what one knows, one has to hold such knowledge up for public inspection by other people who have received public recognition as 'knowers' in the particular field of interest" (p. 335).

Keegan (1990) identifies as a central theme in distance education the "reintegration of the teaching acts" in which the processes of teaching and learning are "decomposed" in two different times and places. He states that "[i]n educational analysis, nevertheless, one is concerned only with learning that is the result of communication from a teacher" (p. 328). Juler (1990) argues that discourse provides a metaphor for describing and understanding interaction in distance education. Harasim (1990) concentrates on the cooperative aspect of online conferencing for learning and emphasizes the new environment for social and intellectual interaction that computer networks provide.

On a more general basis, and in the domain of theory of mediated communication, Anderson and Meyer (1988) explain the constructionist concept of meaning:

> for any given piece of content—a television program, a newspaper article, a turn in a conversation—there is no single true meaning that can be derived from the content itself. The first principle of meaning is that meanings are not *delivered* in content but are *constructed* within the semantic frame in which the content appears and is a part. (p. 25)

Although this may seem an extreme argument for semantic relativism, it is helpful to understand the nature of dialogue and its role in determining the nature and amount of structure in instructional transaction.

Second, discourse analysis has been used for exploring communication in classroom interaction as well as in online computer-based teaching/learning systems. For example, Black et al. (1983) compared learner/instructor interaction in a face-to-face classroom situation with an asynchronous computer-based electronic message system. The same instructor delivered the same instructional content in both modes. A "discourse map" was developed to analyze the difference between face-to-face interaction and online interaction. The researchers concluded that "strict sequentiality is not a universal feature of discourse. Discourse in non-real-time media has multiple threads" (p. 74).

To further investigate the appropriateness of discourse analysis for understanding synchronous integrated distance education systems, Linstrum (1988) conducted a study in which she reviewed selected literature in the field of discourse analysis. In addition, she analyzed the videotaped one-on-one conversations of an instructor with thirteen learners during a telelesson. The telelesson was presented on an integrated, synchronous, computer-based data-voice system. (For a detailed analysis of the characteristics of integrated telecommunications, see Saba 1990).

Linstrum's review of selected literature notes Flanders' (1970) development of a coding system for analysis of "direct" versus "indirect" communication between a teacher and students in classrooms. This educational approach to interaction analysis, however, was criticized as imprecise by Sinclair and Coulthard (1975), who developed a linguistic approach to analyzing classroom interaction. Linstrum also considers D'Andrade and Wish's (1985) model of applying speech act theory to research on interpersonal communication. To conduct her analysis of discourse on the integrated system Linstrum used a matrix listing seven categories of the D'Andrade/Wish coding system plus one newly developed category for "communications maintenance." This category does not apply to face-to-face interaction unless media are involved. The D'Andrade/Wish categories were 1) assertion, 2) questions, 3) requests and directives, 4) reaction, 5) expressive evaluation, 6) commitment, and 7) declaration.

Linstrum's (1989) analysis of conversations between the instructor and thirteen learners, based on these eight categories, yielded the type of data that would be useful for determining the *level* and *rate* of each system component in periodic time intervals in a System Dynamics model. System Dynamics uses a programming language called DYNAMO, which defines the mathematical relationships between each system component, as well as among all components as a whole, over specific time intervals. It seems discourse analysis provides the data points that are needed for model building and testing. The Macintosh compatible version of DYNAMO, called STELLA, is currently being considered for future model building efforts. For the reasons described here,

discourse analysis seems to be a natural way of measuring dialogue, as the currency of dialogue is discourse and as its relative absence determines the amount of structure.

In using discourse analysis for future data collection and model building, researchers should be cognizant of the paradox of semantic relativism. Use of discourse analysis is suggested for measurement of system variables only to the point that it does not lead to deconstruction of meaning. A goal of education is sharing the meaning of accumulated past experience with future generations. This goal does not include deconstructing the meaning of that history. For example, in the telelesson analyzed by Linstrum, learners were to master specific objectives identified for the use of a word processing program on an integrated, synchronous, data-voice computer system. In this telelesson, the purpose was not for learners to deconstruct the information so that each could make his or her own procedure for using the word processor.

Discovery learning may be more vulnerable to a deconstructionist interpretation than is mastery learning. Discourse analysis should be augmented with additional means of data collection, such as post-telelesson interviews with learners, to assure validity and reliability of collected data when elaboration and interpretation is encouraged. Autonomy and learner freedom should be safeguarded without rendering discourse analysis useless by deconstructing the meaning of instructional transactions. Studies such as that conducted by McComb (1989) should be followed up in the future to clarify this essential issue.

Plan for Future Inquiry

Since the onset of research on distance education in the San Diego State University Department of Educational Technology, a number of graduate students have shown a great deal of interest in following this line of inquiry with me. Several projects are of particular interest here. Bober (1990) recently completed an analytical study in which she concentrated on each of the eight categories of speech acts used by Linstrum. Bober reviewed the definition for each category and clarified its meaning. Her study should facilitate future experiments for resolving new and outstanding issues in model building. For example, in an earlier study Black (1988), now an alumnus of the department, analyzed the discourse of an instructor with sixteen learners to see if there was a difference in "share" versus "non-share" modes of communication on an integrated telecommunications system. In the share mode the same text appeared on the instructor's and learners' screens, and both could word-process the same text simultaneously. The telelesson was on simple word-processing tasks.

The comparative data yielded no significant difference between the modes in terms of utterences. However, in the interviews conducted by Black after learners completed the telelesson

on the computer, several issues emerged. Four subjects reported that sharing screens was beneficial because they did not need to describe their particular problems to the instructor. As one commented, "I liked when you were sharing because I didn't have to explain to you what I was doing." The result of this interview poses important theoretical questions: Is screen sharing a form of dialogue? Is dialogue the same as conversation between instructor and learner, or learner and learner? *If screen sharing reduces the level of dialogue (conversation) between instructor and learner, does it necessarily increase the level of structure?*

The efforts described here have concentrated on the concept of dialogue and its measurement through discourse analysis. Exploring the concept of structure requires comparable effort. Cox (in progress) is examining the concept of structure. Traditionally, instructional materials prepared by distant educators prior to their reception by learners have been highly structured. But is the nature of text, graphics, and video on a shared screen the same as prepared materials as far as structure is concerned? Cox's study will shed more light on this and other questions regarding structure.

For example, as stated earlier, the relative absence of dialogue determines the amount of structure. Preliminary results of Cox's study show that level of dialogue may be too simplistic a criterion. The nature of structure is more complex than originally anticipated and its measurement should be carefully considered in future studies. In a related study, Shearer is working on the concept of control in distance education. His study is concentrating on learner control, in particular, but inevitably will take other forms of control in distance education into consideration.

These studies are preparation for developing and testing a more complex dynamic model than the one proposed in 1988, a model that will be more representative of essential variables identified in the current body of distance education theory. The synergy created in the First Symposium and the publications that followed were invaluable to me and my students in conducting our studies. I hope I will be able to report the result of the work currently underway in future meetings and publications. In future reports I plan to

- discuss the concept of structure in detail;
- discuss the role of learner control as it relates to dialogue, structure, and autonomy; and
- present a more elaborate dynamic model of distance education.

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Computer Empowerment and the Ten Thousand Things

Gerald M. Santoro

Introduction

Some time around the year 2000 BC, legendary Chinese philosopher Lao Tzu wrote in the *Tao Te Ching* of the "ten thousand things" (Feng and English 1972). This reference was a metaphor for the human practice of assigning labels to things in the real world. By nature we tend to group things into topics and assign labels to them. Lao Tzu's point was that we come to know these things according to the labels and therefore the labels have the unfortunate effect of altering our perception of these natural phenomena.

This aspect of human nature creates a problem when learning how to use computer systems and applications. The names we assign to computer functions influence the way we come to understand these functions. Thus people speak of "booting" their computer, "spooling" files, or "scripting" essays. This can have the negative effect of preventing the human user from ever developing a real understanding of the functionality of computers and of how to make them work for the user's own information needs.

The problem posed by the effect of computer concept labels on user understanding is important for educators seeking to integrate computers into the curriculum. It is anticipated that computer systems and tools will be increasingly utilized by students from pre-school to graduate school. Educational institutions continually work to improve student access to computer technology, maintaining that "computing skills are an educational necessity" (Chesebro and Bonsall 1989). Our long-term success with educational technology will, in large part, be determined by our success at enabling students to effectively use computer systems, applications, and networks in open-ended ways. These ways should build on skills and application strategies that grow with their information needs. The goal is the "empowerment" of the student to use the available technical resources effectively.

This problem is relevant to the field of distance education to the degree that the computer is a useful vehicle for instructional delivery and communication. The empowered student is the student capable of mastering the technology and using it in support of course goals and educational objectives. Empowerment builds self-reliance, an important feature to promote when instruction proceeds at a distance. Empowerment results from a "sense of mastery" that includes the ability to

productively operate computers and computer software in pursuit of the student's goals (Davie and Wells 1991).

The Problem

People typically approach the computer as an awe-inspiring "black box." They know that they need it for certain functions, yet they are intimidated by the vast amount of information about computers and the completely false assumption that they must somehow become computer scientists in order to ever really understand computers. The result is that some students approach computers as if they were arcane magical entities. Without ever even trying to understand what is really happening, they learn apparently magical command sequences that usually have desirable effects.

Of course, this policy leads to the negative result of users who can utilize computers for years without ever gaining any real understanding of how the computers work. Such users are forever prevented from developing innovative ways to use the computer in solving their information problems. They are relegated to doing certain things in certain ways and always being followers rather than leaders. Even worse, such users will always need someone to guide them through new applications.

Various approaches have been developed and used to deal with this problem, sometimes referred to as the "computer literacy" problem. One approach focuses on training the user, and has the goal of helping the user learn how to master the machine. This approach includes such strategies as documentation, tutorials, audio/visual aids, hands-on training, etc. Another approach concentrates on the design of the computer system and attempts to make the system intuitively easy to use through mnemonic commands, standardized command structures, built-in help, graphic-user interfaces, menu systems, etc.

The common goal of both approaches is to help the user develop skill with important computer functions. The functions are intended to let users manipulate data important to their information problems. Such functions include word-processing for electronic mail, notes, journal keeping, or essay composition; computer conferencing for class-related discourse; use of network data servers for information gathering; running of simulations or CAI (computer aided instruction) programs related to course content; etc.

Implicit in both approaches to the computer literacy problem is the realization that there are many different ways to design systems and to teach their use. Some ways undoubtedly are more effective than others; however, much more research is needed to determine all of the design and

teaching factors that determine effectiveness. In fact, a major problem is simply defining the goal: What do we mean by "effectiveness" of design and teaching, and how do we measure it?

Often effectiveness is defined as achievement of a short learning curve to limited computer functionality. Systems that promise that users can become somewhat productive within minutes are aiming for this goal. However, I propose that an alternative way to define effectiveness is in terms of the degree to which the design or training contribute to the empowerment of students to use computer functions for their own information needs.

One factor strongly influencing empowerment is the way in which students conceptualize what they learn. Labels, tags, and names can be important to the degree that they carry their own meanings. Different names for a command or labels for a function can add to or detract from the level of student conceptualization necessary for empowerment to occur. It is not too difficult to imagine situations in which the terms used in a computer system or application actually impede the conceptualization process. For example, how many students new to the Unix operating system are confused by commands such as "cat," "ls," or "grep"? Until the underlying concepts begin to take shape, labels are seen for what they are: mere symbols.

Computer documentation provides many examples of poorly selected terminology because the writers of the documentation have a biased perspective from being too close to the computer program. Most computer documentation strives for accuracy and consistency at the expense of readability. While this documentation may be adequate for users already familiar with the computer system or similar applications, it is often woefully inadequate for the needs of the new user. One useful tactic for dealing with this problem is to use the computer documentation solely for reference while using a more user-oriented book, often available from a local bookstore.

Design approaches such as graphic/user interfaces and menu systems do not completely avoid the problem of conceptualization in computer literacy. The users must still attach their own conceptual labels to the functions underlying the graphic actions or menu choices. Graphic manipulations provide shortcut approaches to certain functions, such as moving a file or beginning an application, by reducing the need for syntactic memorization and, thus, often result in a shorter learning curve. Unfortunately, users whose only experience has been through graphic/user interfaces or menu systems may not have any greater understanding of what is happening than users of command-line systems.

A similar, but often more detrimental, approach to improving effectiveness is customization. Many current computer systems allow users to customize their environment. A simple example is the use of TSRs on IBM-PC systems and INITs on Apple Macintosh systems. In fact, most computer systems provide some kind of "aliasing" facility or "batch language" from which system customization can be built. In terms of simple initial learning, customization may prove advantageous through the creation of terms that relate to the current desired function rather than to

the more general global function. Thus a function for electronic mail might be customized to "Send-Note-to-Instructor." Unfortunately, this practice can lead to overcustomization with the end result being user confusion. The very terms initially created to make learning easy stand in the way of understanding what is really happening.

An extreme, but not uncommon, example is that of the faculty member who gets a new personal computer but who does not know how to set it up and does not have the time to invest to figure it out. A computer support person (or a friend, colleague, or graduate student) is called to set up the system and install software. This helper does the things necessary to install the operating system, applications, and useful utilities. He or she also writes down enough notes for the faculty member to know how to get from one application to another and perhaps gives a training session or two.

The initial appearance is one of success. The faculty member is able to begin struggling with the applications and is happy. To an observer, the faculty member seems more productive. If anything goes wrong, the faculty member simply goes back to the initial helper for more help. But what has really been achieved? Is this person truly able to use technology in new and innovative ways? Does this faculty member even have a basis for knowing what kinds of things might be possible with the newly acquired computer systems? Probably not.

The problem surfaces later when something goes wrong with the hard disk and the faculty member asks, "What backups?" Alternatively, the faculty member may try to install new software or upgrade old software unaided and inadvertently trash the system due to lack of experience. This results in further intimidation and a lessening of the probability that the user will ever feel empowered. The effect is an initial gain followed by a long-term loss and continued need for support resources.

There is some hope, however. Different computer systems do have major functional similarities. Exploiting these similarities in system design and training has the potential for advancing empowerment by aiding in user conceptualization of underlying computer functions. A result is students who are able to move easily from one computer system to another or to tackle new applications because they are able to think in terms of general similarities in functionality rather than being stuck on syntactic differences.

An analogy may be found by comparing human languages. People in all countries perform similar functions such as eating, sleeping, and playing. Different terms are used in different languages to describe these functions. However, knowing that there are underlying functional similarities provides a semantic basis for learning and using the foreign terminology and syntax. The conceptualization is based on the underlying function and not on the language term. This provides language empowerment.

Customization is not always a bad practice, but it can have the negative result of preventing students from developing a deeper understanding of what they are doing and why. It can also lead to an incorrect conceptualization due to an inaccurate interpretation of the meaning of the label used. In other words, the students become so focused on details that they cannot see the bigger picture. Customization becomes a problem when it leads to overcustomization that sacrifices long-term understanding for short-term skill acquisition. The important questions are: How much should we customize and when? and How do we provide ways for students to deepen their understanding of computer applications after they have successfully acquired the basic skills?

Briefly stated, then, the problem is this: How do we, as educators and system designers, provide our faculty and students with computer systems that facilitate easy learning and yet empower these users to go beyond specific tasks to general conceptualization?

Discussion

For the past thirteen years I have been working in academic computing support. Much of my work involves teaching faculty and students how to use available computer technology effectively and providing support consultation. More recently I have been involved in providing assistance to faculty integrating computer technology in the curriculum for instructional support. Many of these are Liberal Arts courses; therefore, the applications employed are typically qualitative rather than quantitative. Instructional support is intended to exploit available technology for the enhancement of the instructional experience and course goals.

More recently I have been developing and teaching courses in Humanities Computing. The goal of these courses is the development of skills and an effective understanding of computer applications with a focus on the kinds of information problems faced by persons in the Humanities. The students in these courses typically have little prior computer experience. Most of the experience they do have is either from game playing or word processing on a personal computer. Other students have taken courses in which electronic mail was used for instructional support, and a few students are genuinely computer apprehensive. Computer technology (primarily computer-mediated communication or CMC) is used for both course support and as part of the course subject matter.

The instructional support role of computer technology is based on an approach known as the Group Decision Support System (GDSS), which is characterized by an open-ended set of tools for manipulating data. Such functions may include accessing, storing, processing, displaying, and transferring data. The actual data set and use of tools is determined by the user.

The use of CMC for instructional support is an excellent example of the GDSS approach. The user is provided with certain CMC tools such as electronic mail, file transfers, interactive messaging, conferencing, and message database systems. However, the actual content, destination, and purpose of the communications are up to the user. Combination with other computer applications achieves additional functionality. Examples are the combination of word-processing with CMC for the production of electronic journals and newsletters and the combination of database systems with CMC to provide online information servers.

Some customization may be desirable if it can be tailored to the specific needs of the course without sacrificing the possibility of students mastering the overall system. For example, there might be useful shortcuts for certain kinds of destinations or transfers. Additional supplemental information might be available online. Guidelines might be provided for the extent and nature of student discourse.

Still, the tools and the general and specific procedures employed are the same. Both tools and procedures must become so familiar that they are no longer an impediment, but rather become a natural addition to the users cognitive repertoires. At this stage, empowerment begins.

To reach this level of empowerment, students must have learned certain skills with the computer system and the required applications: they must have become computer literate. While one does not have to become a computer scientist or programmer in order to effectively use computers, there is a minimal set of skills and knowledge required to use the computer in effective or innovative ways. One must have knowledge of the tool and skill in its use to apply it effectively and intelligently.

A recent discussion on the BITNET-based Adult Education Forum (AEDNET) pointed to this need for basic skills as a prerequisite to functional understanding. One forum member made available a document explaining the use of electronic mail on the Internet. Another forum member, after examining this document, responded:

> anyone who thinks this document "lets the cat out of the bag" for those who need a guide to Internet or to gateways between networks is,...well, wrong. One has to know quite a lot already before such a document becomes intelligible, much less useful! (AEDNET 1991)

An analogy can be made with the case of making music with a keyboard instrument. Some people buy an automated CASIO synthesizer and fool themselves into believing they are making music with pre-programmed sequences. However, it takes a certain amount of practice and some fairly mundane learning to develop the skill necessary to really make music. But what a wonderful transformation it is when students become able to make their own music! This is the level of empowerment, and this level is much quicker to reach with a computer than with a keyboard.

Effective computer literacy to support computer empowerment should cover at least two areas. The first area, basic systems fundamentals, includes simple operating system commands and movements for file management, security considerations such as backups and/or virus protection, and installation of the operating environment and major application packages. The second area, application fundamentals, should cover the structure and capabilities of each application, how and when to use the application to perform needed functions, and references for further information.

This approach is taken in three courses for which I developed instructional CMC support. Speech Communication 350 is a course in group problem solving that uses CMC and text-processing applications for instructional support. Liberal Arts 482/483 are courses in computer applications for the Humanities that additionally teach micro-mainframe communications, use of the Internet, word processing, database systems, spreadsheet systems, high-function workstations, DOS, and Unix.

Both courses begin the semester with a "blitz" of basic computer literacy designed to teach just enough skill to use CMC and text-processing applications effectively in course communication. The goal is the early empowerment of students in the use of these systems as a base for further learning. This approach has been extremely successful in all three classes and is being emulated by an increasing number of other courses throughout The Pennsylvania State University.

Part of the success of these courses stems from the emphasis on local (course specific) documentation that describes the computer system and covers the basic computer literacy skills in ways relevant to the course. Many course-relevant examples are also given. Additionally, training is provided in all three courses using local networks and the best locally available projection equipment to demonstrate applications in class or at special training sessions. The terms used in the instruction of these basic computer literacy skills are function specific rather than system specific. The student knows that "DIR" and "FLIST" are ways of getting a listing of files, rather than confusing the name of the command with the function itself. Students come to understand that commands are merely programs for carrying out certain functions.

Taking this idea a step further, students in Liberal Arts 482/483 eventually come to recognize the commonalties of functions on different kinds of computer systems. They therefore gain insight into the underlying ways that computers work, and can work for them, rather than being mystified by terminology. This insight results in empowerment.

Possible Solutions

Before I suggest some ways of solving the problem of the "ten thousand things," I need to present what I believe are the major obstacles to resolution of the problem. First, many faculty

members are not, themselves, empowered. They are not well enough versed in the available current technology to be able to visualize how it may be integrated into their courses. The problem of faculty empowerment is aggravated by their other required duties and by the fact that instructional innovation may not provide points toward tenure in research institutions.

Second, there is a general lack of centralized institutional support for the development of courses integrating computer technology into the curriculum. Besides the need for available computer systems and access devices (terminals, microcomputers, or, at least, modem banks), there is a need for professional computer support staff to aid in the development of the courseware and its ongoing support. If the courses are designed and developed properly, this support should be minimal. Competition with researchers for this same set of support staff exacerbates the problem.

Third, terminology for many functions and concepts employed by computer systems are not standardized. A useful common glossary of functions would help standardize the approach to computer literacy training, regardless of the system platform on which it is based.

Fourth, some members of technical fields actually encourage the air of mystique surrounding computer technology. In this way many computer professionals achieve high self-esteem and status, a situation sometimes referred to as the "wizard syndrome."

Fifth, research in the application of GDSS type computer technology in education is inadequate. There is a need for cognitive studies, human factors studies, and system design studies to identify which approaches work and which do not.

Finally, there is the lack of focus on the computer as a lifelong human and educational tool. This focus is needed so that the human, as well as technological, factors are considered. The aim should be the development of new learning skills that take advantage of information technologies and that provide a consistent growth path from elementary school through college and beyond.

What can we, as educators and computer professionals, do to encourage the development of empowering approaches for computer use? We can develop institutional strategies that encourage faculty to examine effective use of computers in instruction. Points toward tenure should be provided as should centralized assistance with the development of courseware and computer literacy. We can encourage the sharing of effective methods, courseware, and strategies as means to more widespread empowerment.

We can, as a discipline, help to adopt standardized terminology, approaches, and procedures for certain information skills that users will have to acquire. However, we will have to proceed in a way that does not impede the use of these skills in innovative ways. Concise, readable documentation, function-oriented training, and clear assistance channels can help to make this goal possible.

We can, as creators of learning environments, encourage an outward perspective among technical support personnel. Allowing them to actively participate in course design, development, and operation enables them to contribute to the ongoing growth and success of the course. They become counselors of empowerment among faculty and, eventually, among students.

We can, as professionals, encourage useful studies on the effectiveness of various design and training approaches to computer systems for instructional support. Real cost-benefit analyses of different approaches using various technologies must be performed as well as cognitive and human-factor studies of various human/machine interfaces.

Finally, we must encourage the development of a perspective that views the computer as a tool for lifelong human learning: a tool that grows and changes as the needs and capabilities of its human user matures from one stage of learning to another, and that will accompany and assist the human operator through a career and into retirement.

Summary

The development of computer empowerment among faculty and students is fundamental to the effective use of the computer as an instructional support tool. Failure to achieve empowerment will cause people to use computers in trivial or ineffective ways; such failure could result in significant lost potential and the damaging belief that rosy predictions regarding computer use in education are all fantasy.

The development of an educational and institutional environment that encourages empowerment will certainly take some time, and is clearly a long-range goal. However, as Lao Tzu would say, "The journey of 10,000 miles begins with but the first step."

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Interactive, Televised Instruction: What Is Its Potential for Interaction?

Helen Ritchie

Interactive, televised instruction has been shown to be effective in terms of performance, cost effectiveness, and student attitudes toward learning (Moore and Thompson 1990). The effectiveness of televised instruction was established in the 1960s prior to the widespread use of simultaneous interaction (Chu and Schramm 1967). Simply put, televised instruction compares favorably in terms of performance and attitudes with traditional face-to-face instruction. Effectiveness of simultaneous interaction between participants has not been as widely documented. A search of the literature produces few papers addressing this issue. Criteria specifically applicable to interaction effectiveness have not yet been developed. One of the difficulties in determining interaction effectiveness may be that interaction differs with the kind of instruction involved.

Instruction with televised interaction may consist of single-session presentations, a series of telecasts, or traditional credit courses at the K–12 or higher education levels. Telecasts may be embedded within a face-to-face instructional format. Each kind of instruction has its own interaction characteristics. For example, interaction during on-going instruction in college credit courses may be quite different than the interaction generated during a single telecast by a recognized subject-matter expert. Evaluation of interaction effectiveness must be based on the needs of the instructional design.

Some objectives of instructional interaction found in the literature included more positive attitudes toward instruction, better comprehension, maintaining a semblance of traditional face-to-face learning conditions, and promotion of faculty acceptance of distance education (Baldwin 1987; Collins and Murphy 1987; Moore 1987). Interaction must take place if these objectives are to be met.

While the focus of this paper will be on interaction during higher education credit courses, it may be useful to review some aspects of simultaneous interaction in other instructional settings. The following examples of data from studies of traditional credit, higher education courses revealed that little simultaneous interaction took place in face-to-face settings.

A study by Hillocks (1981) on three instructional modes indicated that, in the most interactive mode, about fifty percent of the students interacted during the quarter-long course. Thus, fifty percent of the students did not interact over the same period of time. The least interactive mode resulted in seventy percent of the students not interacting. Results of another interaction study on credit courses indicated that student interaction constituted about five percent of instructional time

(Lewis and Woodward 1984). Interaction was found to be predominantly utterances about facts, not "thoughts" (Hoetker and Ahlbrand 1969).

The description of face-to-face classrooms described above indicates that interaction by individual students was a small part of instruction. Nevertheless, interaction during instruction was valued by students and educators alike (Flanders 1970; Atherton 1972; Meredith 1982).

Data from electronically mediated interaction studies indicated differences from face-to-face interaction. Real-time interaction between participants in distance education are characterized by a loss in bandwidth (channels of possible communication) during communication. Televised interactions (whether two-way audio and video or two-way audio with one-way video) share some of the interaction characteristics of other media such as computer conferencing, audio only, and videographics. Some bandwidths are missing in all media compared to bandwidths present in face-to-face instruction. Although televised instruction is able to transmit the images and voices of all participants during instruction, only limited parts of instruction are actually transmitted. Even when cameras continuously record participants, instructor(s), and instructional material, generally a limited number of images are telecast by the production personnel.

Interactions over electronically mediated instruction have been found to be shorter, less friendly, less emotional, and less personal. They were also more serious, businesslike, and task-oriented, with fewer interactions, and fewer off-task utterances. Non-verbal communication was diminished (Hiemstra 1982). A study by Ritchie (n.d.) indicated that instructional mode influenced the number of interactions but not the individuals who interacted.

The above descriptions can put comparisons of televised and traditional face-to-face instructional interactions into perspective. Interaction was found to be a small part of instruction in the traditional classroom. Less interaction was reported over electronic media than in face-to-face settings. This suggests that televised instruction with interactive hardware using traditional instruction has little chance of producing much interaction. Studies on the effectiveness of interaction during televised instruction under present circumstances would be confounded by limited data due to inadequate interaction frequencies.

According to the data presented, electronically-mediated instruction results in less interaction than would be expected during face-to-face instruction. The average amount of instructional interaction during traditional instruction constituted less than five percent of instructional time with about 50 percent or fewer students (under the best traditional circumstances) interacting. How then can distance education instructors hope to make effective use of the interactive potential of expensive hardware? Techniques other than those used in traditional face-to-face instruction are needed to realize the potential of interactive hardware used in distance education.

According to Moore (1989), there are three kinds of instructional interaction: learner with content, learner with instructor, and learner with learner. Instruction in higher education

overwhelmingly consists of lecture (learner with instructor interaction). Instead of continuing with a lecture format, Moore advocates the use of learner-with-learner interaction during televised, interactive instruction. Instruction which provides information, now done with lectures, could be done with books and other instructional materials. Valuable televised instructional time could then be used for student-to-student interaction. In distance education settings this could increase the amount of interaction, providing a way to release the potential of "interactive" hardware.

Interaction that occurs during credit instruction appears to be a small part of instruction. This strikes an ominous note for distance education systems, which historically have fewer and shorter utterances than face-to-face communication. Interaction which takes place during televised credit instruction is limited in frequency and scope. To justify the hardware, personnel, and planning necessary to provide for interaction, more effective instructional methods need to be developed. Interaction frequencies must be increased before the effectiveness of simultaneous interaction can be determined. Then criteria for defining effective interaction can also be developed.

Studies focusing on instructional factors that contribute to effective interaction are necessary. Then methodology can be developed to release the potential provided by the expensive electronic hardware available. This is an essential component of effective simultaneous interaction. Traditional classroom methods are not adequate to generate the levels of interaction required in order to justify the cost of providing simultaneous interaction. Providing simultaneous interaction potential cannot be justified by present levels of interaction in courses using traditional classroom methods.

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National and State Policy in Distance Education: The Issues and Research

Richard T. Hezel

Introduction

Distance education is a new enterprise in the United States. While the practice of distance education has been observable for at least a century, recently new forces, especially technologies, have changed the thrust of distance education to a more technology-driven enterprise. The drive to use technology has initially complicated the process of educational delivery. The focus on education and, according to many observers, the emphasis on program delivery has been displaced by a disproportionate concern with the implementation of technology.

Such observations appear to be typical in the innovation and diffusion process. The process of adoption of distance education through technology, like the process of adoption of innovations, has several stages, and distance education administrators usually engage in at least three stages that are of concern here. First is the technology adoption stage, a phase that is highly oriented toward practice and action: appropriating technology to deliver programs to distant learners. The second phase is focused on the acquisition and development of programming. Later, in the third phase, research is undertaken to assess the real needs of the target audience for distance education and to evaluate the effects of an operating distance education system.

Considerably lower in the list of priorities for operating and funding organizations is the development of policy. As one distance education administrator noted, "We're so busy getting the distance education system operating, we don't have time to make policy." Casual observations of national, state, and local distance education systems in the United States suggest that the administrator has much company: until recently, policy development in distance education, especially within systems and programs, has been sparse. Few state or local distance education projects, even the most active U.S. projects, have written or published a coherent set of policies.

Only recently has policy in distance education become a matter of formal consideration in the development of distance education systems. Distance education observers and scholars are gratified to witness a declining preoccupation with technology and a growing concern about the quality and effectiveness of distance education programming. As delivery technologies become more transparent and programming receives more attention, policy development may, in turn, receive more attention from educators.

Policy Research Questions

The current reluctance to develop policy leaves few immediately available data for the serious policy researcher. In itself, however, the lack of data suggests abundant opportunities for research and a list of policy research questions. Some examples are:

- What are the most important policy areas for distance education?
- Why are distance educators reluctant to develop policy?
- What are distance educators' perceptions of the role of policy?
- What are the components of a coherent policy?
- What path do distance educators normally take in developing a coherent policy?
- What are the factors involved in the development of a useful policy statement?
- Who are/should be the key leaders in distance education policy making?
- What effect does policy have on the successful implementation of distance education?
- What is the influence of research from other areas of distance education on policy making?

While research in distance education policy is sparse, there are signs of growing interest in policy development and in policy research. Currently, most "policy research" consists of descriptions of sets of distance education policies that are thought to be important in distance education. Far less evident is research by which policy evaluation and analysis is undertaken. Nevertheless, the descriptive listing of distance education policies is an important first step in policy research.

Policy Issues Research

During the last four years, Hezel Associates, through the support of the Annenberg/CPB Project, has engaged in research on statewide coordination of educational telecommunications (cf. Hezel 1987; Hezel Associates 1990). In addition to a description of telecommunications activities and planning in each of the fifty states, the report contains an evaluation of telecommunications governance structures. Although the research has a deliberate orientation toward state technology and telecommunications policy, it has been the springboard for the collection of data about other policy issues. Initially an informal by-product of the data collection on state coordination, the policy information aggregated from the states has become the basis of systematic new distance education policy research.

If the research questions above point to potential new areas of policy research, the distance education policies themselves, whether adopted or only articulated as an expression of policy need, are the outcome of one important research question: What are the critical policy issues for consideration by distance education practitioners? Our analysis of distance education policies in the states and at the local level has led to the development of a policy "taxonomy." The policy areas that are important to distance educators can be grouped in several categories. The following categories have been described by Hezel (1990):

- Governance
- Management
- Planning processes
- Technology and telecommunications
- Economic and financial
- Programming
- Accreditation
- Certification
- Registration
- Faculty
- Pedagogical
- Research on effects and effectiveness
- Policy redevelopment

Each of the policy areas contains a subset of policy issues that have been considered, reviewed, or implemented as policy by some distance educators. Each of the policy categories differs in relevance to the federal, state, or local distance education organization.

A Sample of Past and Current Policy Research Areas

Other researchers have been active in the investigation of distance education policy. One of the most visible distance education documents is the U.S. Congress, Office of Technology Assessment report, *Linking for Learning* (1989). Like other research in the area, the report provides a description of distance education in the United States and offers federal and state policy recommendations that are based on the observations.

The U.S. Department of Education also has supported policy research in technology and education. The research (Hezel 1990; Holznagel 1990) has been concerned with how technology and telecommunications are factors in resolving national education issues such as school restructuring, teacher and administrator professional development, and at-risk students (Hixson

and Jones 1990; Rockman 1990). Hansen (1987) advances distance education policy issues that affect the survival of small schools in the United States.

Goldstein and Woolsey (1987) describe types of distance education funding sources and the policies that attend to the use of each source. More broadly, Goldstein (n.d.) has described the laws and policies that affect distance education—particularly through the regulation of finance, institutional approval, and attendance—as well as federal program implications.

Federal and state telecommunications policies are matters of urgent concern to distance educators because the policies and regulations directly affect the cost of distance education. Gallagher and Hatfield (1989), among others, have investigated the issues of telecommunications deregulation and the availability of reasonable-cost telecommunications services for distance education.

Although not considered "research" in themselves, several conferences recently have treated distance education policy issues, and such conferences are often bellwethers of research to come. The conference issues often set the agenda for later research. Program development research and recommendations, for example, were the theme of a presentation by Jennings Bryant at a recent meeting sponsored by the University of Alabama on interactive telecommunications, and a recent New York Regents College Symposium focused on accreditation and regulation of distance education courses. Those policy issues and others were discussed in McGill and Jonsen (1987).

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